L 6455-66
ACCESSION NR: AP5019854

annealing plays a very important role and that the experimental data obtained at temperatures above 4K are in satisfactory agreement with the single-ellipsoid model of the valence band. A detailed study of some singularities observed at T < 4K indicates that the valence band has a more complicated structure near the energy minimum. "We are grateful to L. L. Korenblit, G. Ye. Pikus, and Yu. A. Firsov for a discussion of the theoretical questions, and to M. S. Bresler and to N. Choudri (Solid State Institute, Delhi, India) for taking part in some of the measurements at helium temperatures." Orig. art. has: 8 figures and 3 formulas.

ASSOCIATION: Institut poluprovodnikov AN SSSR, Leningrad (Institute of Semiconductors AN SSSR)

SUBMITTED: 26Feb65 ENCL: 00 SUB CODE: SS, EM
NR REF SOV: 007 OTHER: 003

nw
Card 2/2

L 6931-66

ACCESSION NR: AP5000314 S/0056/64/047/005/1683/1686

AUTHORS: Shaly*t, S. S.; Parfon'yev, R. V.; Aleksandrova, M. V. 14 B

TITLE: Concerning a new type of oscillation of longitudinal magnetoresistance of n-InSb

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 47, no. 5, 1964, 1683-1686

TOPIC TAGS: magnetoresistance, galvanomagnetic effect, indium antimonide, electron scattering, inelastic scattering, phonon

ABSTRACT: This is a continuation of earlier research by some of the authors (Parfen'yev, Shaly*t, and V. M. Muzhdaba, ZhETF v. 47, 444, 1964) and is devoted to the temperature dependence of the oscillations of longitudinal magnetoresistance of n-InSb in a strong magnetic field. These oscillations were first predicted theoretically by V. L. Gurevich and Yu. A. Firsov (ZhETF v. 40, 199, 1961) and

Card 1/3

L 6931-66

ACCESSION NR: AP5000314

are due to inelastic scattering of electrons by optical lattice vibrations. The tests were made on single crystal n-InSb ($n = 4 \times 10^{13}$ cm^{-3}, $u = 4.9 \times 10^5$ cm^2/V-sec at T = 90K) in the temperature range from 90 to 200K. The results show that with increasing temperature the minima of the oscillating part of the magnetoresistance move away from the resonant values of the magnetic field, and are replaced by maxima. The reason for this shift is attributed to the role played by optical phonons in the scattering of electrons in pure n-InSb, which increases with increasing temperature. A noticeable change in the electron concentration (by a factor of 30) does not result in a noticeable phase shift of the oscillation curves. Orig. art. has: 2 figures and 1 formula.

ASSOCIATION: Institut poluprovodnikov Akademii nauk SSSR (Institute of Semiconductors, Academy of Sciences SSSR); Institut fiziki poluprovodnikov Akademii nauk SSSR (Institute of Semiconductor Physics, Academy of Sciences SSSR)

Card 2/3

L 14962-66 EPF(n)-2/EWP(k)/EWT(l)/EWT(m)/EWP(b)/EWA(d)/EWP(t) IJP(c) GG/
ACC NR: AP6002467 AT/WW/JD SOURCE CODE: UR/0386/65/002/011/0514/0519

AUTHOR: Itskevich, Ye. S.; Muzhdaba, V. M.; Sukhoparov, V. A.; Shalyt, S. S. 78 B

ORG: Institute of High Pressure Physics, Academy of Sciences SSSR; Institute of Semiconductors, Academy of Sciences SSSR

TITLE: Influence of hydrostatic pressure on the effective mass of electrons in InSb 27

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 2, no. 11, 1965, 514-519

TOPIC TAGS: indium compound, antimonide, magnetoresistance, electron, pressure effect, magnetic field intensity

ABSTRACT: Data are given from an experimental study of the direct effect which hydrostatic pressure of up to 8000 kg/cm^2 has on the effective mass of electrons. The experimental method was based on the new Gurevich-Firsov magnetophonon resonance phenomenon. The specimen studied was a single crystal of *n*-type InSb with dimensions of 2 × 2,5 × 16 mm, a concentration of $8 \cdot 10^{13}$ cm^{-3} and a mobility of $7 \cdot 10^5$ cm^2/v-sec at 77°K. The relative reduction in the linear dimensions of the crystal was no greater than 0.6% at maximum pressure. Curves are given showing the trans-

Card 1/2

verse magnetoresistance as a function of magnetic field strength at various pressures. Formulas are given for determining the effective mass of electrons from the period of the oscillations and from the position of the individual maxima on these curves. Calculations show a change in effective mass from 0.016 to 0.025 when the pressure is changed from 1 kg/cm^2 to 8000 kg/cm^2. Since the width of the forbidden zone in this pressure interval increases by a factor of 1.5, the experimental data confirms the theoretical conclusion of direct proportionality between the effective mass of electrons and the width of the forbidden zone for an InSb crystal in this pressure interval. Orig. art. has: 3 figures, 3 tables.

SUB CODE: 20/ SUBM DATE: 20Oct65/ ORIG REF: 002/ OTH REF: 004

L 15733-66 EWT(l)/EWT(m)/ETC(f)/EPF(n)-2/EWG(m)/T/EWP(t)/EWP(b) IJP(c)

ACC NR: AP6000894 SOURCE CODE: UR/0181/65/007/012/3690/3691

JD/WW/AT

AUTHORS: Aliyev, S. A.; Shalyt, S. S.

ORG: Institute of Semiconductors, AN SSSR, Leningrad (Institut poluprovodnikov AN SSSR); Institute of Physics, AzSSR, Baku (Institut fiziki AzSSR)

TITLE: Thermal conductivity and thermal emf of gallium arsenide at low temperatures

SOURCE: Fizika tverdogo tela, v. 7, no. 12, 1965, 3690-3691

TOPIC TAGS: thermal conduction, thermal emf, gallium arsenide, temperature dependence, phonon scattering, phonon spectrum, single crystal

ABSTRACT: The purpose of the investigation was to determine experimentally the shift in the position of the maximum of thermal conductivity and thermal emf of GaAs with decreasing temperature. This is claimed to be the first investigation of the thermal emf of GaAs at low temperatures. The single crystal sample measured 3.5 x 4.0 x 60

Card 1/2

L 15733-66

ACC NR: AP6000894

mm, and the electron concentration and mobility at 77K were 2 x 10^{16} cm^{-3} and 4500 cm^2/v-sec. The measurements were made by a method in which a stationary heat flow was used. The plots of the temperature dependence of the thermal conductivity and of the thermal emf indicate that the dragging of the free electrons by the phonons in the sample is quite pronounced, but no noticeable shift in the maxima is observed. This indicates that only the long-wave part of the phonon spectrum which is responsible for the dragging effect, participates in the thermal conductivity of the investigated sample at low temperatures. The small part played by the phonons with shorter wavelengths in the heat transfer can be due to their stronger scattering by point defects, which in the case of GaAs may be either the impurity atoms or the gallium isotopes. Both the thermal conductivity and thermal emf show a maximum near 20K. Authors thank M. N. Pivovarov for help with the work. Orig. art. has: 1 figure.

SUB CODE: 20/ SUBM DATE: 15Jul65/ OTH REF: 001

Card 2/2

L 24373-66 EWT(m)/ETC(f)/EWG(m)/EWP(t) RDW/JD/JG

ACC NR: AP6010438 SOURCE CODE: UR/0386/66/003/005/0217/0219

AUTHOR: Zhuze, V. P.; Shalyt, S. S.; Noskin, V. A.; Sergeyeva, V. M.

ORG: Institute of Semiconductors, Academy of Sciences, SSSR (Institut poluprovodnikov Akademii nauk SSSR)

TITLE: Superconductivity of La_3Te_4

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 3, no. 5, 1966, 217-219

TOPIC TAGS: superconductivity, lanthanum compound, telluride, stoichiometry, critical point, critical magnetic field

ABSTRACT: The authors show that La_3Te_4 is a superconductor of the second kind, with properties similar to the La_3Se_4 and La_3S_4, whose superconductivity was reported recently. They also show that the superconducting transition temperature of this substance depends on the technology of its preparation and is possibly connected with some deviation of the composition from the stoichiometry. The lanthanum telluride was synthesized from the components by vacuum sublimation and zone melting, using a procedure described in detail elsewhere (A. V. Golubkov et al., Neorganicheskiye materialy [Inorganic Materials] v. 2, No. 1, 1966). Two samples were tested, one pressed from previously fused material and the other prepared by melting. The critical temperatures of the two samples were 2.45 and 3.75K, respectively. The corresponding critical fields for the destruction of superconductivity were 8 and 12.5 koe, respectively. Magnetic measurements have shown that at 1.4K the Meissner effect

Card 1/2

L 24373-66

ACC NR: AP6010438 2

manifested itself in fields up to 20 and 60 oe in samples 1 and 2, respectively.
The authors thank A. I. Zaslavskiy and T. B. Zhukova for the x-ray phase analysis.
Orig. art. has: 3 figures.

SUB CODE: 20/ SUBM DATE: 22Jan66/ ORIG REF: 001/ OTH REF: 002

Card 2/2 fv

L 29623-66 EWT(1)/ETC(f)/T IJP(c) AT

ACC NR: AP6018539 SOURCE CODE: UR/0181/66/008/006/1776/1786

65
B

AUTHOR: Bresler, M. S.; Parfen'yev, R. V.; Shalyt, S. S.

ORG: Institute of Semiconductors, AN SSSR, Leningrad (Institut poluprovodnikov AN SSSR)

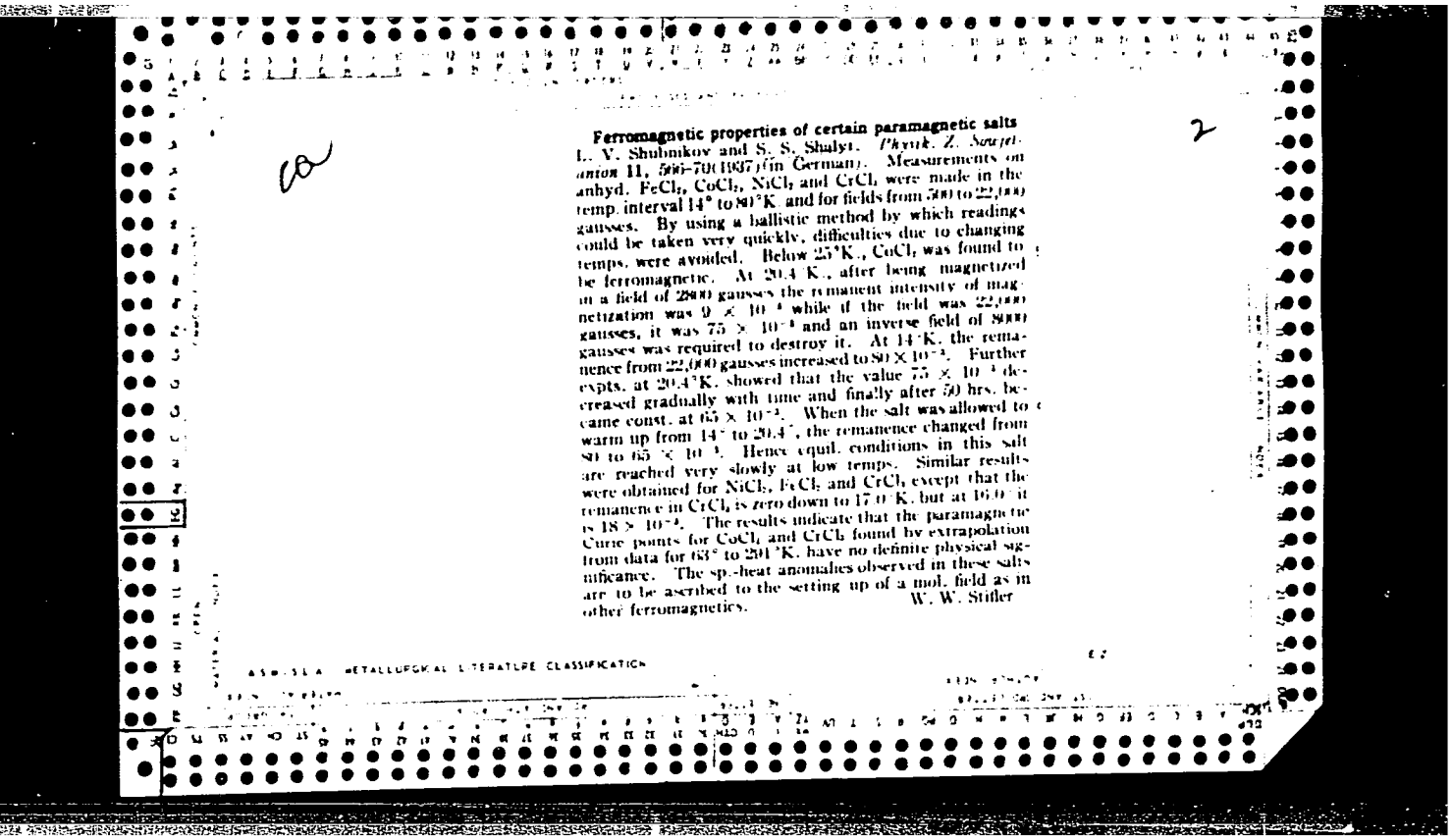
TITLE: Quantum oscillation of the thermal emf in n-InSb

SOURCE: Fizika tverdogo tela, v. 8, no. 6, 1966, 1776-1786

TOPIC TAGS: semiconductor research, semiconductor alloy, indium compound, oscillation, thermoelectric property, magnetic effect

ABSTRACT: Quantum oscillations of the transverse and longitudinal magneto-thermal emf were experimentally investigated in n-type InSb at helium temperatures. The dependence of various kinetic coefficients on the intensity of the magnetic field was carefully studied. Spin-dependent splitting of the Landau energy spectrum was detected in samples with an electron concentration of 3.1×10^{16} cm^{-3}. The g-factor was calculated from the value obtained for the spin. It was found that spin-splitting is larger in the longitudinal field than in the transverse field, and that the effective g-factor in the longitudinal field has a value close to the expected (50). The phase shift of oscillating coefficients of the longitudinal and transverse magneto-thermal emf and the rules governing the increase of these coefficients in the region of the quantum limit were also determined. A comparison of experi-

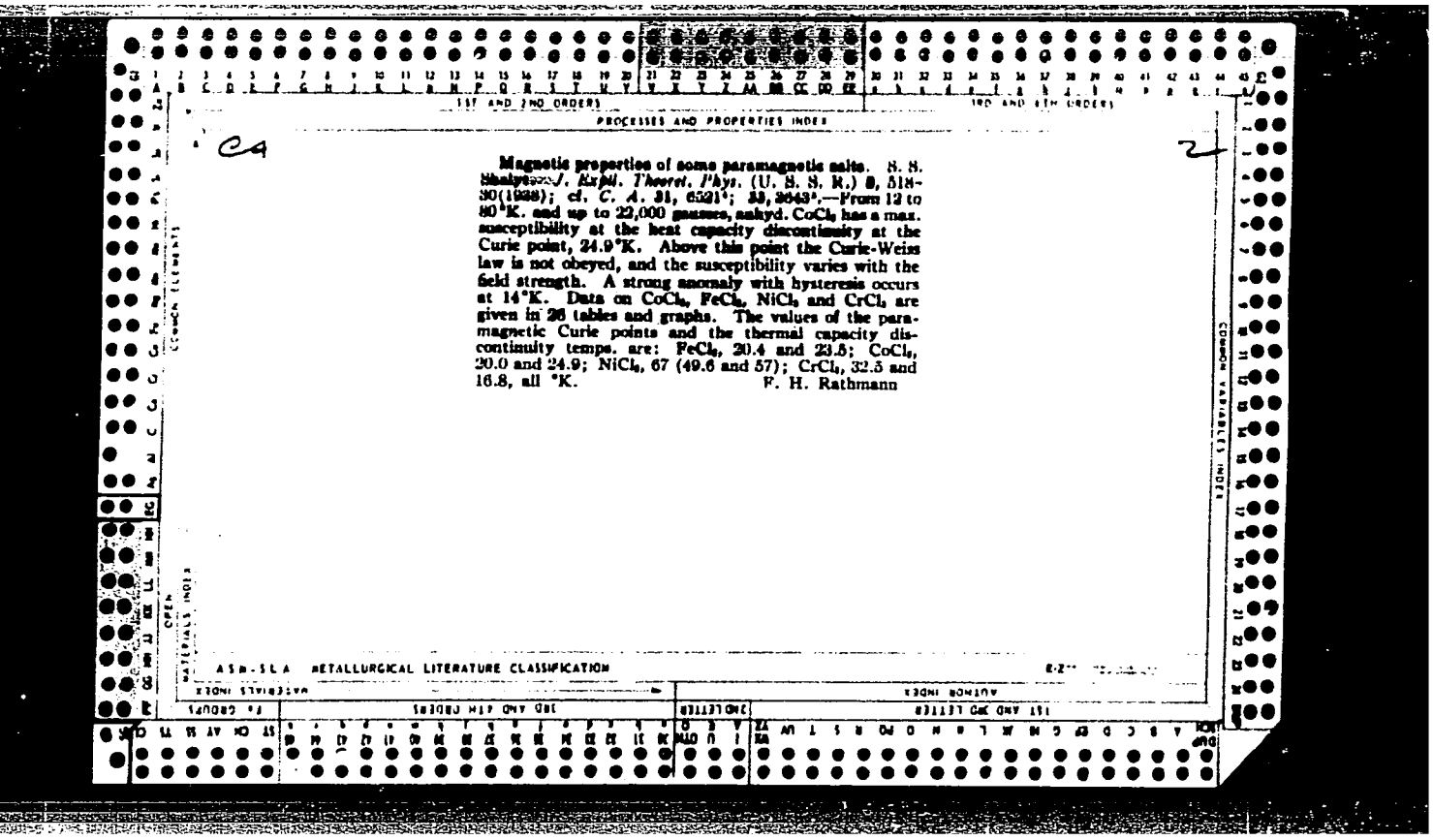
Card 1/2



Ferromagnetic properties of certain paramagnetic salts

L. V. Shubnikov and S. S. Shalyt. *Physik. Z. Sowjetunion* 11, 566–70 (1937) (in German). Measurements on anhyd. $FeCl_2$, $CoCl_2$, $NiCl_2$ and $CrCl_3$ were made in the temp. interval 14° to 80°K and for fields from 500 to 22,000 gausses. By using a ballistic method by which readings could be taken very quickly, difficulties due to changing temps. were avoided. Below 25°K., $CoCl_2$ was found to be ferromagnetic. At 20.4 K., after being magnetized in a field of 2800 gausses the remanent intensity of magnetization was 9×10^{-4} while if the field was 22,000 gausses, it was 75×10^{-4} and an inverse field of 8000 gausses was required to destroy it. At 14°K. the remanence from 22,000 gausses increased to 80×10^{-4}. Further expts. at 20.4°K. showed that the value 75×10^{-4} decreased gradually with time and finally after 50 hrs. became const. at 65×10^{-4}. When the salt was allowed to warm up from 14° to 20.4°, the remanence changed from 80 to 65×10^{-4}. Hence equil. conditions in this salt are reached very slowly at low temps. Similar results were obtained for $NiCl_2$, $FeCl_2$ and $CrCl_3$ except that the remanence in $CrCl_3$ is zero down to 17.0°K. but at 16.0° it is 18×10^{-4}. The results indicate that the paramagnetic Curie points for $CoCl_2$ and $CrCl_3$ found by extrapolation from data for 63° to 291°K. have no definite physical significance. The sp.-heat anomalies observed in these salts are to be ascribed to the setting up of a mol. field as in other ferromagnetics.

W. W. Stifler



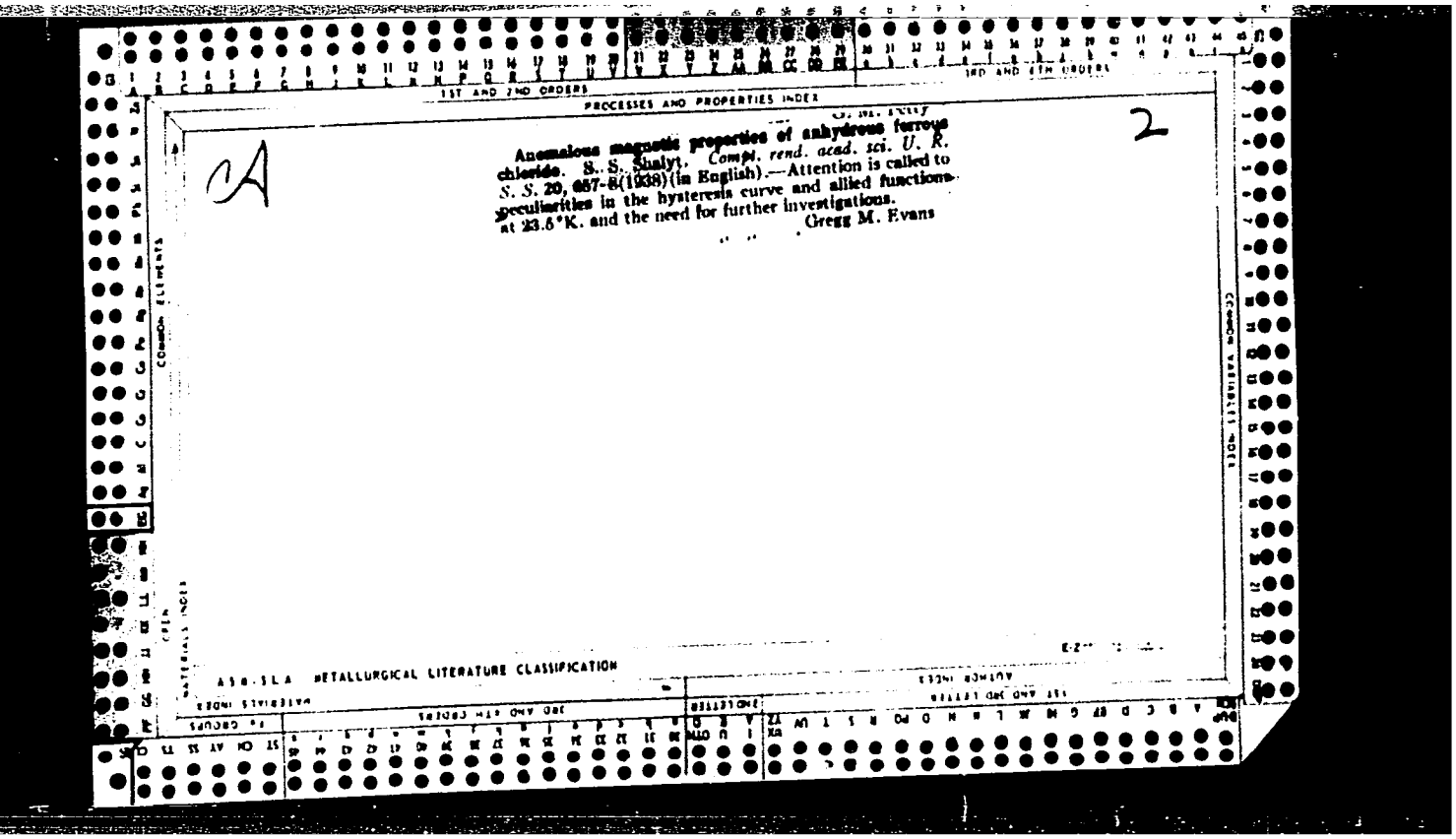
PROCESSES AND PROPERTIES INDEX

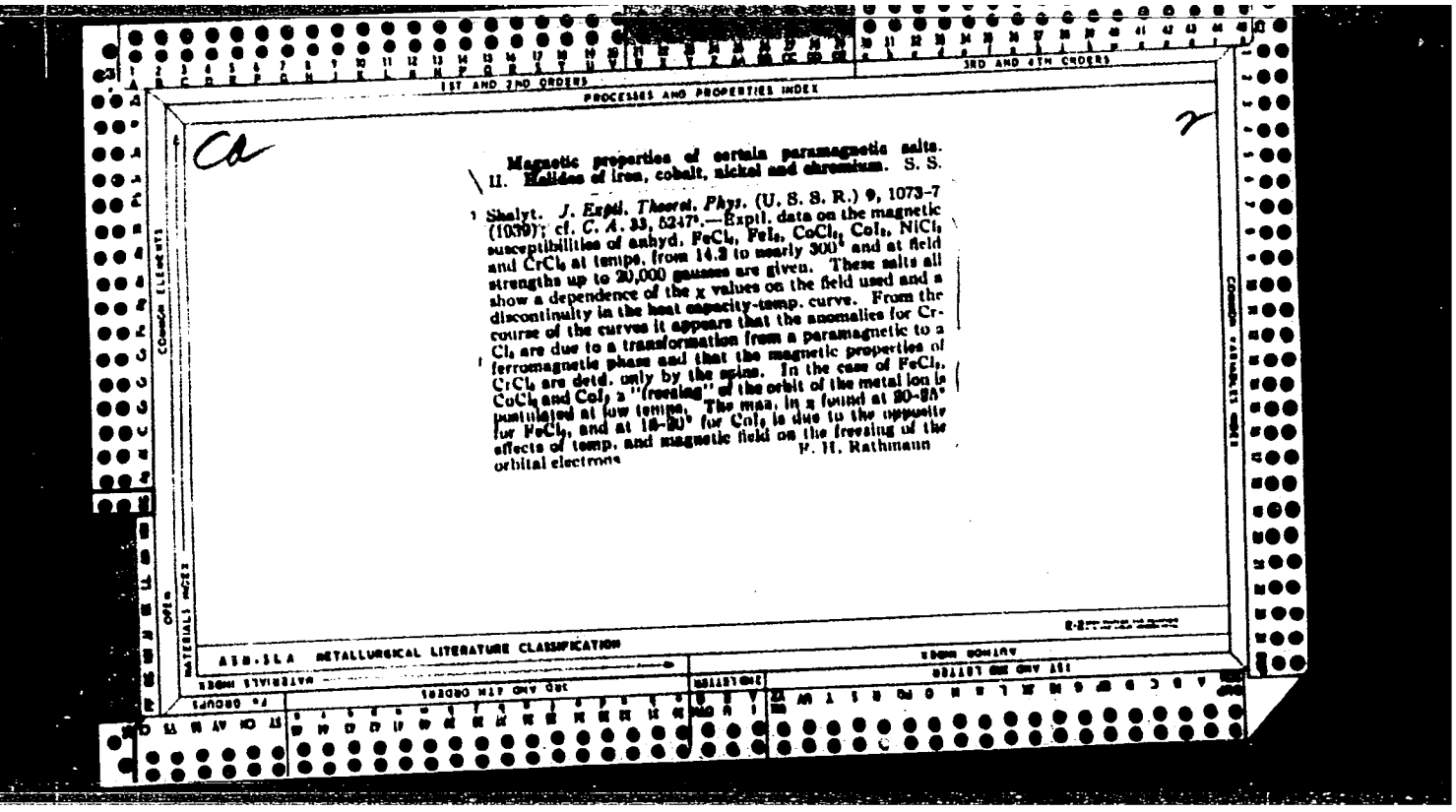
C4

2

Magnetic properties of some paramagnetic salts. S. S. Shalyt...*J. Exptl. Theoret. Phys.* (U. S. S. R.) **8**, 518-30(1938); cf. *C. A.* **31**, 6521[4]; **33**, 3043[8].—From 12 to 80 °K. and up to 22,000 gausses, anhyd. $CoCl_2$ has a max. susceptibility at the heat capacity discontinuity at the Curie point, 24.9°K. Above this point the Curie-Weiss law is not obeyed, and the susceptibility varies with the field strength. A strong anomaly with hysteresis occurs at 14°K. Data on $CoCl_2$, $FeCl_2$, $NiCl_2$ and $CrCl_3$ are given in 26 tables and graphs. The values of the paramagnetic Curie points and the thermal capacity discontinuity temps. are: $FeCl_2$, 20.4 and 23.5; $CoCl_2$, 20.0 and 24.9; $NiCl_2$, 67 (49.6 and 57); $CrCl_3$, 32.5 and 16.8, all °K. F. H. Rathmann

A S M - S L A METALLURGICAL LITERATURE CLASSIFICATION





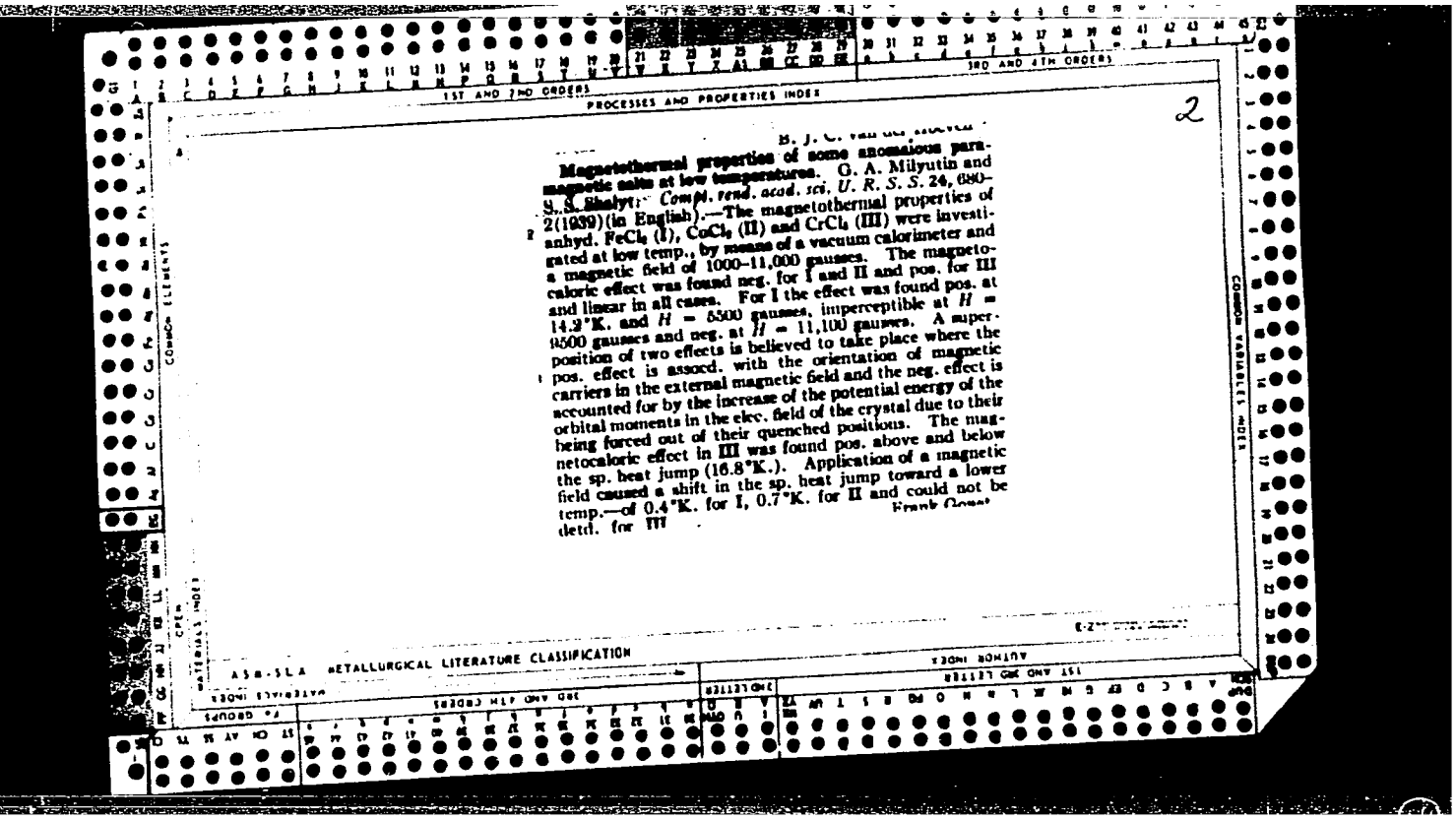
PROCESSES AND PROPERTIES INDEX

Ca

Magnetic properties of certain paramagnetic salts. II. Halides of iron, cobalt, nickel and chromium. S. S. Shalyt. *J. Exptl. Theoret. Phys.* (U. S. S. R.) 9, 1073–7 (1939); cf. *C. A.* 33, 5247⁹.—Exptl. data on the magnetic susceptibilities of anhyd. $FeCl_3$, FeI_2, $CoCl_2$, CoI_2, $NiCl_2$ and $CrCl_3$ at temps. from 14.2 to nearly 300° and at field strengths up to 20,000 gausses are given. These salts all show a dependence of the x values on the field used and a discontinuity in the heat capacity-temp. curve. From the course of the curves it appears that the anomalies for $CrCl_3$ are due to a transformation from a paramagnetic to a ferromagnetic phase and that the magnetic properties of $CrCl_3$ are detd. only by the spins. In the case of $FeCl_3$, $CoCl_2$ and CoI_2 a "freezing" of the orbit of the metal ion is postulated at low temps. The max. in x found at 80–85° for $FeCl_3$, and at 18–20° for CoI_2 is due to the opposite effects of temp. and magnetic field on the freezing of the orbital electrons. P. H. Rathmann

2

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION



PROCESSES AND PROPERTIES INDEX

1ST AND 2ND ORDERS

3RD AND 4TH ORDERS

2

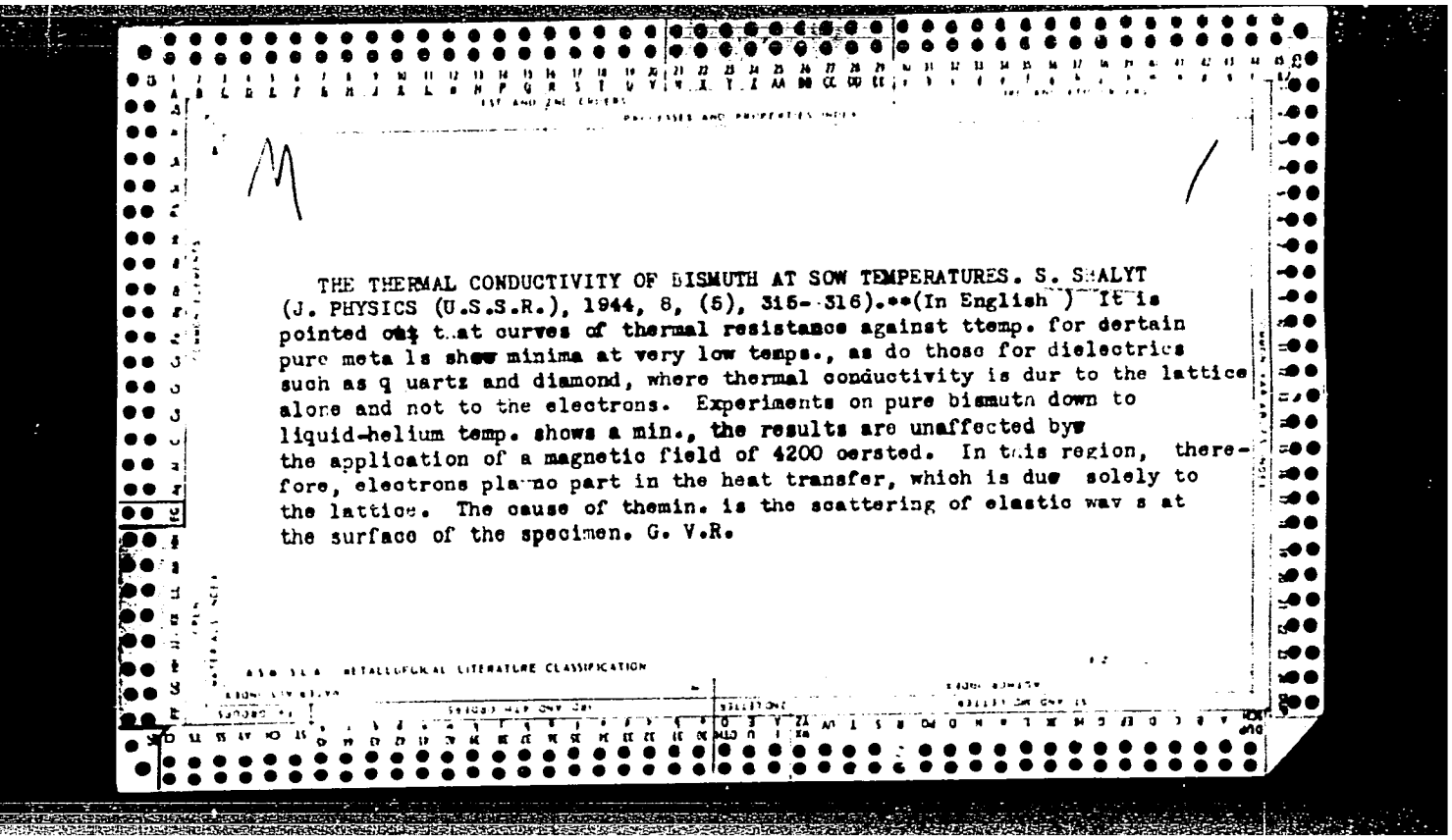
B. J. C. van der Hoeven

Magnetothermal properties of some anomalous paramagnetic salts at low temperatures. G. A. Milyutin and S. S. Shalyt: *Compt. rend. acad. sci. U. R. S. S.* 24, 680–2(1939)(in English).—The magnetothermal properties of anhyd. $FeCl_3$ (I), $CoCl_2$ (II) and $CrCl_3$ (III) were investigated at low temp., by means of a vacuum calorimeter and a magnetic field of 1000–11,000 gausses. The magnetocaloric effect was found neg. for I and II and pos. for III and linear in all cases. For I the effect was found pos. at 14.2°K. and H = 5500 gausses, imperceptible at H = 8500 gausses and neg. at H = 11,100 gausses. A superposition of two effects is believed to take place where the pos. effect is assocd. with the orientation of magnetic carriers in the external magnetic field and the neg. effect is accounted for by the increase of the potential energy of the orbital moments in the elec. field of the crystal due to their being forced out of their quenched positions. The magnetocaloric effect in III was found pos. above and below the sp. heat jump (16.8°K.). Application of a magnetic field caused a shift in the sp. heat jump toward a lower temp.—of 0.4°K. for I, 0.7°K. for II and could not be detd. for III

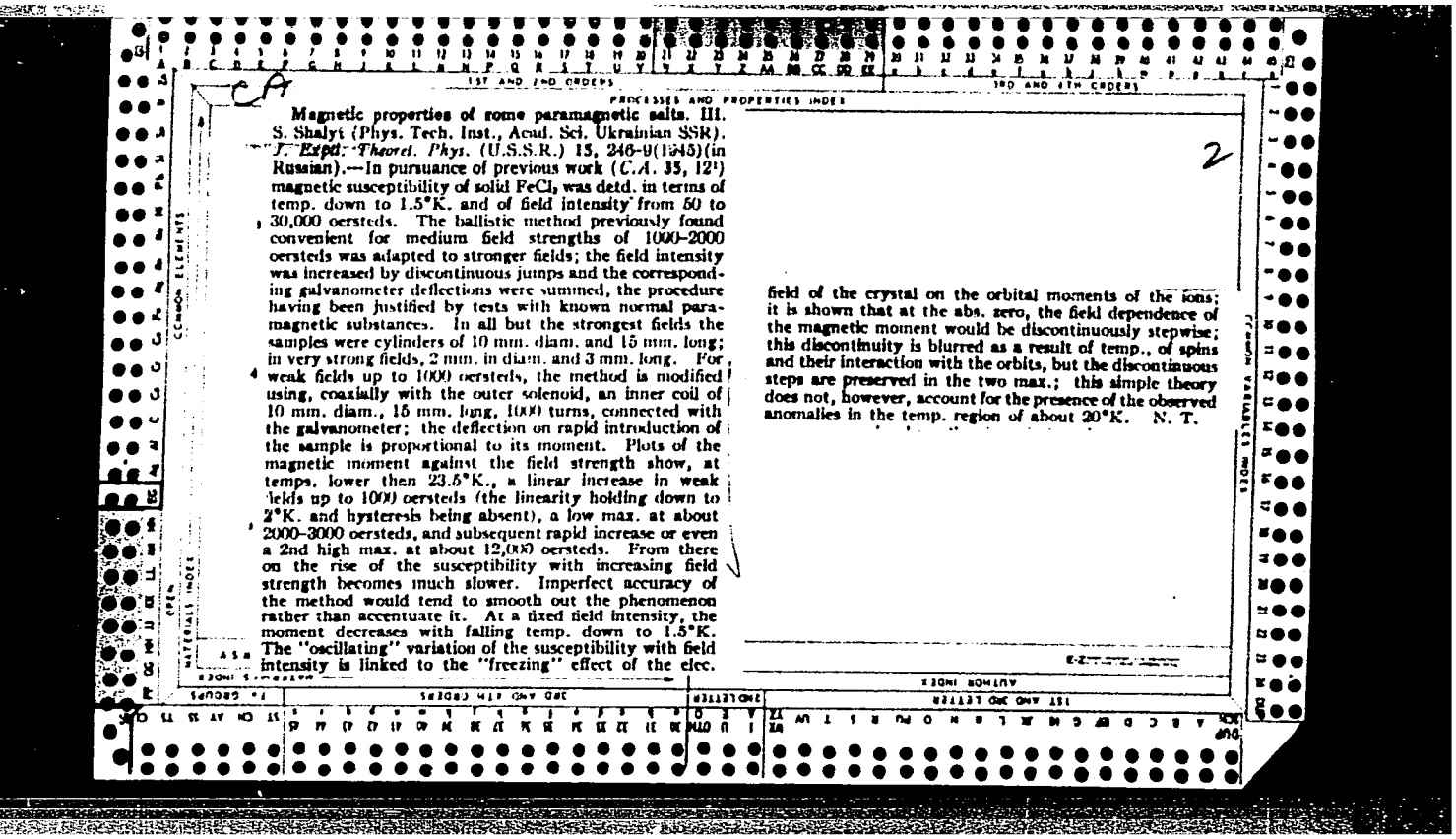
Frank Cleaves

METALLURGICAL LITERATURE CLASSIFICATION

AUTHOR INDEX



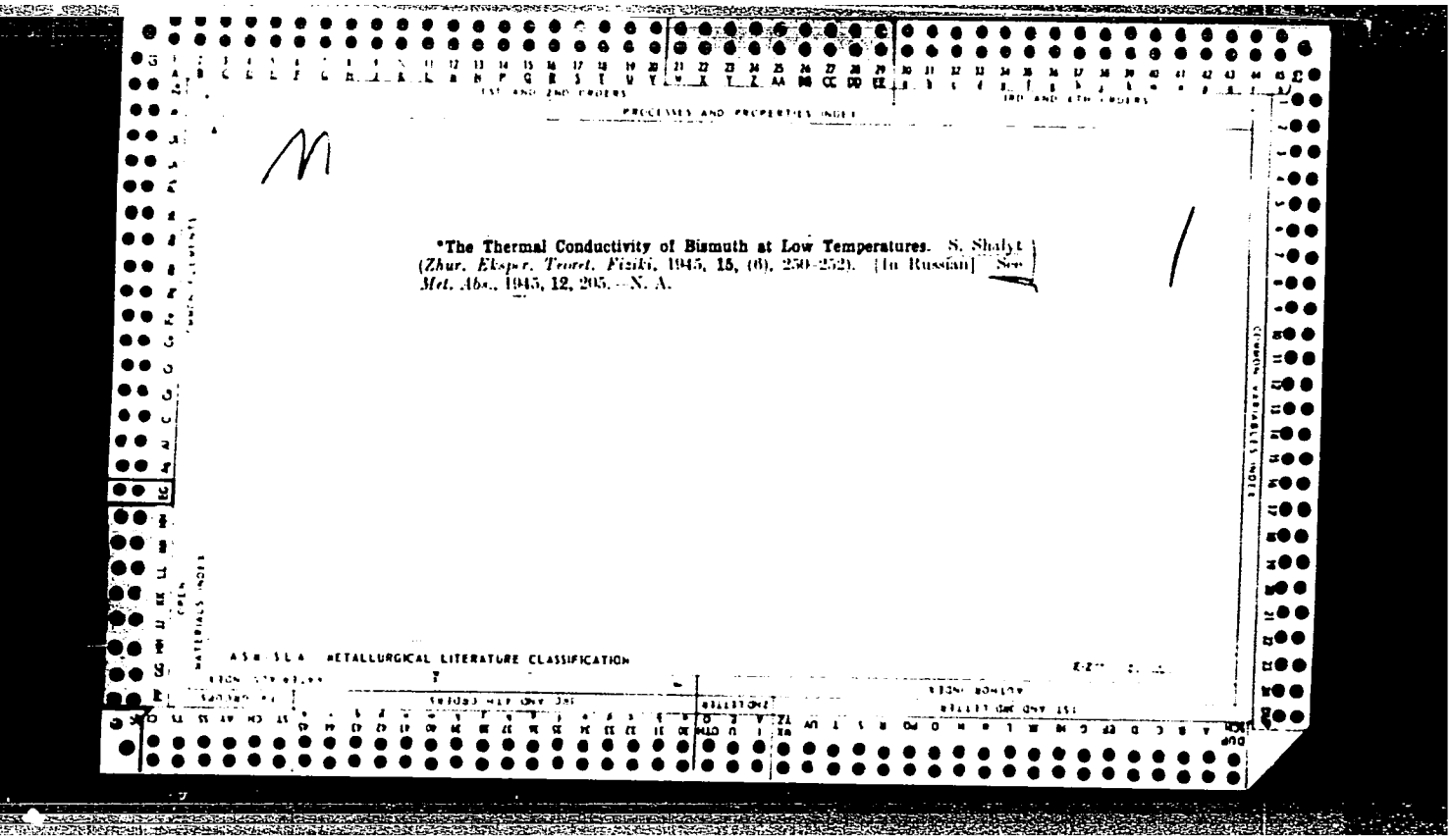
THE THERMAL CONDUCTIVITY OF BISMUTH AT SOW TEMPERATURES. S. SHALYT (J. PHYSICS (U.S.S.R.), 1944, 8, (5), 315--316).**(In English) It is pointed out that curves of thermal resistance against ttemp. for dertain pure meta ls shew minima at very low temps., as do those for dielectrics such as q uartz and diamond, where thermal conductivity is dur to the lattice alone and not to the electrons. Experiments on pure bismuth down to liquid-helium temp. shows a min., the results are unaffected byw the application of a magnetic field of 4200 oersted. In this region, therefore, electrons pla no part in the heat transfer, which is due solely to the lattice. The cause of themin. is the scattering of elastic wav s at the surface of the specimen. G. V.R.



CA

Magnetic properties of some paramagnetic salts. III. S. Shalyt (Phys. Tech. Inst., Acad. Sci. Ukrainian SSR). *J. Expil. Theoret. Phys.* (U.S.S.R.) 15, 246-9(1945)(in Russian).—In pursuance of previous work (*C.A.* 35, 12[1]) magnetic susceptibility of solid $FeCl_3$ was detd. in terms of temp. down to 1.5°K. and of field intensity from 50 to 30,000 oersteds. The ballistic method previously found convenient for medium field strengths of 1000–2000 oersteds was adapted to stronger fields; the field intensity was increased by discontinuous jumps and the corresponding galvanometer deflections were summed, the procedure having been justified by tests with known normal paramagnetic substances. In all but the strongest fields the samples were cylinders of 10 mm. diam. and 15 mm. long; in very strong fields, 2 mm. in diam. and 3 mm. long. For weak fields up to 1000 oersteds, the method is modified using, coaxially with the outer solenoid, an inner coil of 10 mm. diam., 15 mm. long, 1000 turns, connected with the galvanometer; the deflection on rapid introduction of the sample is proportional to its moment. Plots of the magnetic moment against the field strength show, at temps. lower than 23.5°K., a linear increase in weak fields up to 1000 oersteds (the linearity holding down to 2°K. and hysteresis being absent), a low max. at about 2000–3000 oersteds, and subsequent rapid increase or even a 2nd high max. at about 12,000 oersteds. From there on the rise of the susceptibility with increasing field strength becomes much slower. Imperfect accuracy of the method would tend to smooth out the phenomenon rather than accentuate it. At a fixed field intensity, the moment decreases with falling temp. down to 1.5°K. The "oscillating" variation of the susceptibility with field intensity is linked to the "freezing" effect of the elec. field of the crystal on the orbital moments of the ions; it is shown that at the abs. zero, the field dependence of the magnetic moment would be discontinuously stepwise; this discontinuity is blurred as a result of temp., of spins and their interaction with the orbits, but the discontinuous steps are preserved in the two max.; this simple theory does not, however, account for the presence of the observed anomalies in the temp. region of about 20°K. N. T.

2



"The Thermal Conductivity of Bismuth at Low Temperatures. S. Shalyt (*Zhur. Eksper. Teoret. Fiziki*, 1945, 15, (6), 250–252). [In Russian] See *Met. Abs.*, 1945, 12, 205.—N. A.

ASM-SLA METALLURGICAL LITERATURE CLASSIFICATION

USSR/ Physics - Ferromagnetics

Card 1/1 Pub. 43 - 13/15

Authors : Komar, A. P.; Reynov, N. M.; and Shalyt, S. S.

Title : Study of the thermal dependence of spontaneous magnetization of certain ferrites at low temperatures

Periodical : Izv. AN SSSR. Ser. fiz. 18/3, 406-408, May-Jun 1954

Abstract : The thermal dependence of spontaneous magnetization of ferrites was investigated at such low temperatures where the semi-conductive nature of these ferromagnetic compounds is best revealed. The temperature of the sample was determined by the type of the liquid and saturated vapor pressure over the liquid. The effect of magnetic reflection in the iron poles was determined by the dependence of the sensitivity of the ballistic system (used in magnetic field calibration), and the magnetic field intensity. Results obtained indicate that the thermal dependence of spontaneous magnetization of Ni-Zn-ferrites shows no change in the entire temperature range (from Curie point to 1.3° K), and shows no change in magnetization at lower temperature. Two references : 1 USSR and 1 French (1950 and 1952). Graphs; drawing.

Institution : Academy of Sciences USSR, Physico-Technical Institute

Submitted : May 3, 1954

The photomagnetic effect in cuprous oxide at low temperatures. A. P. Komar, N. M. Reinov, and S. S. Shalyt (Leningrad Phys.-Tekh. Inst., Acad. Sci. U.S.S.R.). *Doklady Akad. Nauk S.S.S.R.* 96, 47–8(1954).—The dependence of the photomagnetic e.m.f. of Cu_2O (Kikoin, and Noskov, *C.A.* 28, 5326[6]; *C.A.* 33, 4807[3]) on the applied field was studied at low temp. (77 and 4°K.). The range of the magnetic field strength was 0–24 × 10^3 oersteds. At 77°K. the deviation from linearity starts for fields > 10,000 and at 4°K. for fields > 3000 oersteds. The av. mobility of the current carriers was detd. as 1–2 × 10^2 c.g.s. (77°K.) and 3–6 × 10^4 c.g.s. (4°K.). L. R. [illegible]

62

(2)

SHALYT, S.S.

538 : 536.48

822

Conference on Low-Temperature Magnetism: Khar'kov, 1st–3rd July 1954.—(*Bull. Acad. Sci. U.R.S.S., sér. phys.*, July/Aug. 1955, Vol. 19, No. 4, pp. 387–488. In Russian.) The issue contains a summary of the 20 papers read at the conference and texts of nine papers including:

PH Galvanomagnetic Phenomena and Properties of Conduction Electrons in Metals.—E. S. Borovik (pp. 429–443).

Investigation of Photomagnetoelectric Effect in Cuprous Oxide at Low Temperatures.—A. P. Komar, N. M. Reinov & S. S. Shalyt (pp. 444–446).

Electrical Conductivity of Ferromagnetic Metals at Low Temperatures.—E. A. Turov (pp. 474–480).

(4)

SUBASHIYEV, V.K., kand.fiz.-mat.nauk; IOFFE, A.F., akademik, glavnyy red.; SOMINSKIY, M.S., kand.fiz.-mat.nauk, zav.glavnogo red.; SHALYT, S.S., doktor fiz.-mat.nauk, red.; REGEL', A.R., kand. fiz.-mat.nauk, red.; SHAGURIN, K.A., inzh., red.; ACHKINADZE, Sh.D., inzh., red.; FREGER, D.P., tekhn.red.

[Semiconductor converters of solar energy] Poluprovodnikovye preobrazovateli solnechnoi energii. Leningrad, 1956. 58 p. (Leningradskii dom nauchno-tekhnicheskoi propagandy. Poluprovodniki i ikh tekhnicheskoe primenenie, no.9). (MIRA 14:4)

(Solar batteries)

SUBJECT USSR / PHYSICS
AUTHOR ŠALYT,S.S.
TITLE The Galvanomagnetic Properties and the Hole Conductivity of Tellurium.
PERIODICAL Dokl.Akad.Nauk, 109, fasc.4, 750-752 (1956)
Issued: 10 / 1956 reviewed: 10 / 1956

The investigation of the galvanometric properties of tellurium at helium temperatures ($T \leq 4{,}2^{\circ}K$) shows that the valence zone in tellurium is split into two energy stripes of different widths. Thus, two groups with hole-like current carriers of different conductivity exist in tellurium. This follows from the following experimental facts and deliberations:
In the admixture domain, i.e. at $T < 200^{\circ}$ K there is only one hole-like conductivity that is independent of the chemical nature of the admixtures. If only one sort of holes exists in tellurium, and if the mobility u of the current carriers is determined according to the formula $u=0{,}52\ R(cm^3/Coul).(cm^2/v.sec)/\varrho_o(Ohm.cm)$, one obtains $u = 1200\ cm^2/V$ sec. (R-HALL'S coefficient at $H \to 0$, ϱ_o - specific resistance at helium temperatures). With this comparatively low degree of mobility the comparatively great modification of HALL'S coefficient on the occasion of the modification of the magnetic field strength from 600 to 26.000 oersted is not comprehensible.
In view of the fact that the curves for the modification of the resistance in the magnetic field have no quadratic domain even in the case of weak fields, it is

SHALYT, S.S.

IOFFE, A.F., akademik; SOMINSKIY, M.S., kand.fiz.-mat.nauk, red.; MASLAKOVETS, Yu.P., doktor fiz.-mat.nauk, red.; SMOLENSKIY, G.A., doktor fiz.-mat.nauk, red.; SHALYT, S.S., doktor fiz.-mat.nauk, red.; REGEL', A.R., kand.fiz.-mat.nauk, red.; SUBASHIYEV, V.K., kand.fiz.-mat.nauk, red.; SHAGURIN, K.A., insh.; red.; ACHKINADZE, Sh.D., insh.; FREGER, D.P., tekhn.red.

[The possibilities of semiconductors and their future development] Vozmozhnosti i perspektivy poluprovodnikov. Leningrad, Leningr. dom nauchno-tekhn.propagandy, 1957. 11 p. (Poluprovodniki, no.18) (Semiconductors)

OSTROUMOV, Andrey Georgiyevich, inzh.; IOFFE, A.F., akademik, red.; SOMINSKIY, M.S., kand.fiz.-mat.nauk, red.; MASLAKOVETS, Yu.P., doktor fiz.-mat.nauk, red.; SMOLENSKIY, G.A., doktor fiz.-mat. nauk, red.; SHALYT, S.S., doktor fiz.-mat.nauk, red.; REGEL', A.R., kand.fiz.-mat.nauk, red.; SUBASHIYEV, V.K., kand.fiz.-mat.nauk, red.; SHAGURIN, K.A., inzh.; ACHKINADZE, Sh.D., inzh., red.; FREGER, D.P., tekhn.red.

[Piezoelectric substances] P'ezoelektriki. Leningrad, Leningr. dom nauchno-tekhn.propagandy, 1957. 30 p. (Poluprovodniki, no.16) (MIRA 10:12)

(Piezoelectric substances)

MIRLIN, David Naumovich; IOFFE, A.F., akademik, red.; SOMINSKIY, M.S., kand.fiz.-mat.nauk, red.; MASLAKOVETS, Yu.P., doktor fiz.-mat. nauk, red.; SMOLENSKIY, G.A., doktor fiz.-mat.nauk, red.; SHALYT, S.S., doktor fiz.-mat.nauk, red.; REGEL, A.R., kand.fiz.-mat. nauk, red.; SUBASHIYEV, V.K., kand.fiz.-mat.nauk, red.; SHAGURIN, K.A., inzh., red.; ACHKINADZE, Sh.D., inzh., red.; FREGER, D.P., tekhn.red.

[Semiconductor bolometers] Poluprovodnikovye bolometry. Leningrad, Leningr.dom nauchno-tekhn.propagandy. 1957. 36 p. (Poluprovodniki, no.4) (MIRA 10:12)

(Bolometer)

7

SMOLENSKIY, Georgiy Anatol'yevich, doktor fiz.-mat.nauk; ISUPOV, Vladislav Aleksandrovich, inzh.; IOFFE, A.F., akademik red.; SOMINSKIY, M.S., kand.fiz-mat.nauk, red.; MASLAKOVETS, Yu.P., doktor fiz.-mat.nauk; SHALYT, S.S., doktor, fiz-mat.nauk; REGEL', A.R., kand.fiz.-mat. nauk; SUBSHIYEV, V.K., kand.fiz-mat.nauk; SHAGURIN, K.A., inzh.; ACHKINADZE, Sh.D., inzh., red.; FREGER, D.P., tekhn.red.

[Seignettoelectric substances] Segnetoelektriki. Leningrad, Leningr.dom nauchno-tekhn.propagandy, 1957. 43 p. (Poluprovodniki, no.15) (MIRA 10:12)

(Ferroelectric substances)

GELLER, Isaak Khaimovich, inzh.; MESKIN, Samuil Semenovich, inzh.; IOFFE, A.F., akademik, red.; SOMINSKIY, M.S., kand.fiz.-mat.nauk, red.; MASLAKOVETS, Yu.P., doktor fiz.-mat.nauk; SMOLENSKIY, G.A., doktor fiz.mat.nauk; SHALYT, S.S., doktor, fiz.-mat.nauk; REGEL', A.R., kand.fiz.-mat. nauk; SUBASHIYEV, V.K., kand.fiz.-mat.nauk; SHAGURIN, K.A., inzh.; ACHKINADZE, Sh.D, inzh, red; FREGER, D.P., tekhn.red.

[Semiconductor contact rectifiers] Poluprovodnikovye vypriamiteli. Leningrad, Leningr.dom nauchno-tekhn.propagandy, 1957. 94 p. (MIRA 10:12)

(Electric current rectifier)

PASYNKOV, Vladimir Vasil'yevich, doktor tekhn.nauk; IOFFE, A.F., akademik, glavnyy red.; SOMINSKIY, kand.fiz.-mat.nauk, red.; MASLAKOVETS,Yu.P., doktor fiz.-mat.nauk, red.; SMOLENSKIY, G.A., doktor fiz.-mat.nauk, red.; SHALYT, S.S., doktor fiz.-mat.nauk, red.; REGEL', A.R., kand. fiz.-mat.nauk, red.; SUBASHIYEV, V.K., kand.fiz.-mat.nauk, red.; SHAGURIN, K.A., inzh.; ACHKINADZE, Sh.D., inzh.; FREGER, D.P., tekhn.red.

[Nonlinear semiconductor resistors; varistors] Nelineinye poluprovodnikovye soprotivleniia; varistory. Leningrad, Leningr. dom nauchno-tekhn.propagandy, 1957. 35 p. (Poluprovodniki, no.5) (Electric resistors) (MIRA 11:1)

SHALYT, Simon Solomonovich, doktor fiz.-matem. nauk; FREGER, D.P., tekhn.red.

[Electric characteristics of semiconductors] Elektricheskie svoistva poluprovodnikov. Leningrad, Leningr. dom nauchno-tekhn.propagandy, 1957. 2 v. (126 p.) (Poluprovodniki, nos. 1 and 2) (MIRA 11:4)
(Semiconductors)

SOMINSKIY, Monus Samuilovich, kand. fiz.-mat. nauk; IOFFE, A.F., akademik, glavnyy red.; MASLAKOVETS, Yu.P., doktor fiz.-mat. nauk, red.; SMOLENSKIY, G.A., doktor fiz.-mat. nauk, red.; SHALYT, S.S., doktor fiz.-mat. nauk, red.; REGEL', A.P., kand. fiz.-mat. nauk, red.; SUBASHIYEV, V.K., kand. fiz.-mat. nauk, red.; SHAGURIN, K.A., inzh.; red.; ACHKINADZE, Sh.D. inzh., red.; FRENKEL, D.P., tekhn. red.

[Photoresistors] Fotosoprotivleniia. Leningrad, Leningr. dom nauchno-tekhn. propagandy, 1957. 54 p. (Poluprovodniki, no.6). (MIRA 11:9)
(Photoelectric cells)

VORONIN, Anatoliy Nikolayevich, inzh.; IOFFE, A.F., akademik, red.; SOMINSKIY, M.S., kand. fiz.-mat. nauk, red.; MASLAKOVETS, Yu.P., doktor fiz.-mat.nauk, red.; SMOLENSKIY, G.A., doktor fiz.-mat.nauk, red.; SHALYT, S.S., doktor fiz.-mat.nauk, red.; REGEL', A.R., kand. fiz.-mat.nauk; SUBASHIYEV, V.K., kand.fiz.-mat.nauk, red.; SHAGURIN, K.A., inzh.red.; ACHKINADZE, Sh.D., inzh.; FREGER, D.P., tekhn.red.

[Semiconductor thermoelectric generators] Poluprovodnikovye termoelektrogeneratory. Leningrad, Leningr. dom nauchno-tekhn.propagandy, 1957. 43 p. (Poluprovodniki, no.13) (MIRA 11:3)
(Semiconductors) (Electric generators)

ZHUZE, Vladimir Panteleymonovich; IOFFE, A.F., akademik, glavnyy red.; SOMINSKIY, M.S., kand.fiz.-mat.-nauk, red.; MASLAKOVETS, Yu.P., doktor fiz.-mat.nauk, red.; SMOLENSKIY, G.A., doktor fiz.-mat. nauk, red.; SHALYT, S.S., doktor fiz.-mat.nauk, red.; REGEL', A.R., kand.fiz.-mat.nauk, red.; SUBASHIYEV, V.K., kand.fiz.-mat.nauk, red.; SHAGURIN, K.A., inzh., red.; ACHKINADZE, Sh.D., inzh., red.; FREGER, D.P., tekhn.red.

[Semiconducting materials (semiconductor elements)] Poluprovodnikovye materialy (elementy - poluprovodniki). Leningrad, 1957. 101 p. (Obshchestvo po rasprostraneniiu politicheskikh i nauchnykh znanii RSFSR, no.17) (MIRA 12:4)

(Semiconductors)

SHALYT, S S

258

PHASE I BOOK EXPLOITATION

Akademiya nauk SSSR. Institut poluprovodnikov

Poluprovodniki v nauke i tekhnike (Semiconductors in Science and Technology) v. 1. Moscow, Izd-vo AN SSSR, 1957. 470 p. 23,000 copies printed.

Resp. Ed.: Ioffe, A.F.; Tech. Ed.: Arons, R.A.

PURPOSE: The collection of articles "Semiconductors in Science and Technology" is intended for a wide circle of engineers and technicians.

COVERAGE: The first volume of the collection presents the principles of semiconductor theory concerning electric conductivity, thermo- and galvanomagnetic properties, contact phenomena, diffusion and thermoelectric properties. A description of semiconductor devices and their fields of application is given. References are given after each article.

Card 1/19

258

Semiconductors in Science and Technology

TABLE OF CONTENTS: 3

Card 2/19

258

Semiconductors in Science and Technology

difficult problem of semiconductor technique is the creation of heat-resisting semiconductor materials with given electric and thermal properties to be used in economically profitable thermal generators. The author considers the scientific, technical and economic importance of the semiconductor problem to be equal to [illegible] of nuclear energy. He presents

IOFFE, A.F.; OSTROUMOV, A.G., redaktor izdatel'stva; SHALYT, S.Sh., redaktor izdatel'stva; SMIRNOVA, A.V., tekhnicheskiy redaktor

[The physics of semiconductors] Fizika poluprovodnikov. Moskva, Izd-vo Akademii nauk SSSR, 1957. 491 p. (MLRA 10:3)
(Semiconductors)

PA - 2183

THOR SALYT, S.S.

TLE On the Galvanomagnetic Properties of Tellurium at Low Temperatures. (Russian)

RIODICAL Zhurnal Tekhn. Fiz., 1957, Vol 27, Nr 1, pp 189-204 (U.S.S.R.)

Received 2/1957 Reviewed 4/1957

STRACT The present paper investigates the semi-conductor element within the range of helium-temperatures as yet very little investigated. First some relevant previous works are discussed briefly. The following is investigated, 1) The temperature dependence of electric conductivity between 100°C and 1,3°K, 2) galvanomagnetic phenomena: the HALL-effect and the modification of the resistance in magnetic fields up to 26.000 Ørsted at room temperature, nitrogen- and helium-temperature. In this connection monocrystalline and coarse-crystalline tellurium-samples (purified by repeated distillation and melting) are examined. The present work gives the result of the examination of two samples. Measuring was carried out by the method of compensation by means of parallel current. Experimental results are illustrated by diagrams. The electric resistance ϱ of the one sample increases in the whole interval of the field strengths from H = 600 Ørsted to H = 26.000 Ørsted in the case of all operation temperatures up to 1,3°K. No anomalous decrease of the resistance could be observed. The sign of this effect remains normal also in the case of weak field strengths. After cooling from room temperature to helium-temperature, an instability of electric conductivity becomes noticeable, on which occasion the electric resistance of the sample decreases in an asymptotic curve in the course of some time. If various parts of the sample are illuminated by means of

Card 1/2

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67321
SOV/181-1-8-26/32

AUTHORS: Timchenko, I. N., Shalyt, S. S.

TITLE: The Influence of Entrainment of Current Carriers by Phonons Upon the Thermoelectromotive Force of Tellurium

PERIODICAL: Fizika tverdogo tela, 1959, Vol 1, Nr 8, pp 1302 - 1304 (USSR)

ABSTRACT: L. E. Gurevich (Ref 1) was the first to investigate theoretically the interaction of the irregular phonon distribution with the current carriers. This phenomenon, termed "entraining effect", has also been observed experimentally in some semiconductors (Ge, Si, InSb, MoS_2, ZnO). According to C. Herring's theory (Ref 3), the entire thermoelectromotive force of a semiconductor with low current - carrier concentration may be written as the sum $\alpha = \alpha_e + \alpha_{ph}$, where α_e denotes the usual thermoelectromotive force of the electron gas and α_{ph} the additional thermoelectromotive force caused by entrainment of the current carriers by long-wave phonons, i.e.

$$\alpha_{ph} \cong \frac{\tau_{ph}}{\tau_e} \left(\frac{m^* v_s^2}{2} \right) \Big/ \left(\frac{3}{2} kT \right).$$

Card 1/4

The Influence of Entrainment of Current Carriers by Phonons Upon the Thermoelectromotive Force of Tellurium

approach the ideal form $\alpha_{ph} \sim T^{0.5}$. However, in the experiment α_{ph} may decrease more rapidly than according to the ideal law $\alpha_{ph} \sim T^{0.5}$, and the maximum of the $\alpha_{ph}(T)$ curve may be shifted toward higher temperatures. Making reference to Herring's theory, the temperature dependence $\alpha_{ph}(T)$ for tellurium should asymptotically approach the form $\alpha_{ph} \sim T^{-(3-\beta)}$ toward higher temperatures, and toward lower temperatures it should decrease more rapidly than according to the ideal law $\alpha_{ph} \sim T^{0.5}$. At temperatures of liquid nitrogen the current-carrier concentration was $\sim 7.10^{14}$ cm^{-3}. On the basis of the experimental course of the curve $\alpha(T)$ in the range 160 - 80°K and also of S. S. Shalyt's (Ref 4) results on the Hall coefficient R in the temperature range 80 - 2°K, α_e was extrapolated to the temperature range below 70°K (down to 8°K). For the tellurium sample, under consideration the asymptotic value of the exponential coefficient is -2.7, which is in good agreement with Herring's theory; the descending branch of the curve is characterized

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S/181/60/002/011/034/042
B006/B060

24,7600 (1035, 1043, 1158)

AUTHORS: Parfen'yev, R. V., Farbshteyn, I. I., and Shalyt, S. S.

TITLE: Galvanomagnetic Properties of Tellurium. II. The Effect of Heat Treatment Upon the Temperature Course of Mobility

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 11, pp. 2923-2928

TEXT: The concentration dependences of the hole mobility at 77°K in tellurium, as found by several authors, exhibit an exceedingly large spread. The authors of the article under consideration tried to explain the observed anomalous spread of mobility, and, above all, the extremely uncertain temperature course of mobility by ascribing them in the first place to the variety of impurity concentration (which shows in the large spread of concentration dependence of the hole mobility) of the specimens investigated. The effect of heat treatment upon the galvanomagnetic properties was thoroughly examined, and a very considerable influence upon electric resistivity and Hall constant was also observed. The heat treatment took place at 320°C over 70 hours. Fig. 2 illustrates the effect of the heat treatment upon ρ and R, and Fig. 3 upon the Hall mobility R/ρ

Card 1/3

86446

Galvanomagnetic Properties of Tellurium. II. The Effect of Heat Treatment Upon the Temperature Course of Mobility

S/181/60/002/011/034/042
B006/B060

for assistance in preparing the specimens. There are 6 figures and 3 references: 1 Soviet, 1 Japanese, 1 US, and 1 British.

ASSOCIATION: Institut poluprovodnikov AN SSSR Leningrad (Institute of Semiconductors of the AS USSR, Leningrad)

SUBMITTED: July 21, 1960

Card 3/3

27304
S/181/61/003/008/034/034
B111/B102

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24,7700

AUTHORS: Parfen'yev, R. V., Pogarskiy, A. M., Farbshteyn, I. I., and Shalyt, S. S.

TITLE: Effect of a heat treatment upon the anisotropy of the galvanomagnetic properties of tellurium

PERIODICAL: Fizika tverdogo tela, v. 3, no. 8, 1961, 2501-2504

TEXT: The authors determined the hole mobility from the formulas of an isotropic model (one scalar mass and isotropic scattering) using experimental data on the Hall effect and on the reluctance in a weak transverse field. The mobility values determined from the Hall effect and from the reluctance do not differ. At 77.4°K, their ratio in specimens whose trigonal crystal axis is in the direction of the current, approaches a value of 0.85. The difference between u_{Hall} and $u_{\Delta\rho}$ is regarded as a measure of the number of structural defects. Heat treatment of tellurium leads to a rise of mobility, especially in the region of maximum temperature dependence of mobility (below 20°K). In some specimens, the Hall mobility attains $5 \cdot 10^4$ $cm^2/v \cdot sec$ in this region. The difference

Card 1/3

Effect of a heat treatment upon the...

between u_{Hall} and $u_{\Delta\rho}$ can be explained by an anisotropy of the galvanomagnetic properties of tellurium. The fact that a heat treatment leads to an approach of these two values can thus be explained by a decrease in anisotropy due to a diminution of structural defects. In order to verify this conclusion, measurements were made of the longitudinal ($\Delta\rho_{\parallel}$) and the transverse ($\Delta\rho_{\perp}$) reluctance which are more sensitive to anisotropy (of. Fig. 2). The results showed that the galvanomagnetic properties of tellurium single crystals free from structural defects have at least cylindrical symmetry in the range of 4-80°K. The asymmetry found by various authors was due to structural defects. If the latter are dislocations, the anisotropy of electrical properties due to them may result from the strong anisotropy of the mechanical properties of tellurium. L. I. Korovin and Yu. A. Firsov (Ref. 6: ZhTF, XXXIII, 11, 1958) are mentioned. The authors express their gratitude to the latter for having discussed the results. There are 2 figures and 8 references: 3 Soviet-bloc and 5 non-Soviet-bloc.

Card 2/3

27304 S/181/61/003/008/034/034
B111/B102

Effect of a heat treatment upon the...

ASSOCIATION: Institut poluprovodnikov AN SSSR, Leningrad (Institute of Semiconductors, AS USSR, Leningrad)

SUBMITTED: May 9, 1961

Fig. 2: Change of the ratio between transverse and longitudinal reluctance during heat treatment. Legend: (1) u_X - Hall mobility (u_{Hall}), $cm^2/v \cdot sec$.

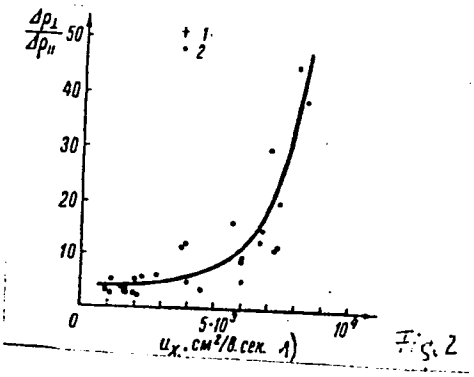

Fig. 2

Card 3/3

SHALYT, S.S.

Effective electron mass in indium arsenide. Fiz. tver. tela 3 no.9:2887-2889 S '61. (MIRA 14:9)

1. Institut poluprovodnikov AN SSSR, Leningrad.
(Electrons) (Indium arsenide)

S/181/62/004/004/014/042
B104/B108

AUTHORS: Timchenko, I. N., and Khalyt, S. S.

TITLE: Thermoelectric properties of tellurium at low temperatures

PERIODICAL: Fizika tverdogo tela, v. 4, no. 4, 1962, 934 - 945

TEXT: The thermoelectric properties were determined on six tellurium specimens (five single crystals and one coarse-grained polycrystal) with carrier concentrations between $3 \cdot 10^{14}$ and $8 \cdot 10^{18}$ cm^{-3} between 2 and 300°K. The measurements were made with the heat flow perpendicular to the direction of the major crystallographic axis. Results: At low temperatures, the thermoelectric properties of tellurium cannot be explained without taking the carrier entrainment by phonons into account. The phonon and diffusion components of the thermo-emf fit the theories of C. Herring (Phys. Rev , 95, 954, 1954; 96, 1163, 1954), and V. L. Gurevich and Yu. A. Firsov (FTT, 4, 536, 1962) regarding the temperature dependence and anisotropy of the entrainment effect in tellurium. The decrease in phonon contribution to the thermo-emf with increasing carrier concentration is

Card 1/2

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Thermoelectric properties of ...

essentially due to phonon scattering by the carriers. Electron gas degeneracy leads to a decrease of the diffusion thermo-emf component. In a specimen with a carrier concentration of 10^{19} cm^{-3}, the entrainment effect augments the thermo-emf of tellurium between 10 and 20°K. The diffusion thermo-emf at lower temperatures is described by the simple formula for the thermo-emf of a metal. Phonon component and heat conductivity are considerably increased by annealing. V. L. Gurevich, Yu. N. Obraztsov, and Yu. A. Firsov are thanked for discussions and advice. There are 7 figures and 1 table.

ASSOCIATION: Institut poluprovodnikov AN SSSR Leningrad (Institute of Semiconductors AS USSR, Leningrad)

SUBMITTED: November 27, 1961

Card 2/2

37934

S/181/62/004/005/023/055
B125/B108

9.4178

AUTHORS: Shalyt, S. S., and Efros, A. L.

TITLE: Quantum oscillation of the galvanomagnetic effects in indium arsenide and indium antimonide

PERIODICAL: Fizika tverdogo tela, v. 4, no. 5, 1962, 1233-1240

TEXT: The quantum theory of electrical conductivity of a degenerate electron gas in a strong transverse magnetic field leads to the formulas of H. P. R. Frederikse, W. R. Holser (H. P. R. Frederikse, W. R. Holser. Sol. St. Phys., Electron and Telecommun., 2, 651, 1960). which determine the position of the maxima, but not those of the minima of the oscillatory curves of reluctance. An electric field applied in the x-direction to InAs and InSb crystals causes an asymmetry in the shifted electrons and, consequently, a current j_x. The formula

$$\left(\frac{1}{H}\right)_{\max}=\frac{2e}{hc}\left(\frac{1}{3\pi^2}\right)^{1/3}\frac{1}{n^{1/3}}\left[\left(I+\frac{1}{2}\right)^{2/3}-\left(\frac{1}{2}\right)^{2/3}\right]^{3/2}. \quad (8)$$

Card 1/6 1

Quantum oscillation of the ...

for the values of $\frac{1}{H}$ at which these maxima occur (according to Frederikse and Holser) has to be supplemented by the factor $(1+\sqrt{2}/\pi \cdot 0.53)^{2/3}$. To verify the quantum-theoretical conclusions, the resistivity and Hall effect of an n-type InAs sample (consisting of 3 - 4 single crystals) were measured with direct current. Results obtained with a weak field shown in Fig. 1 ($R=212$ cm^3/coul, $\sigma=120$ ohm^{-1}cm^{-1}) indicate an electron concentration of $3\cdot10^{16}$ cm^{-3} and a Hall mobility of 25,500 cm^2/v·sec. The factor before the brackets in (6) determines the quasi-period of oscillations in magnetic resistivity. For $n=3\cdot10^{16}$ cm^{-3}, it amounts to $\Delta(1/H)_{theor} = 3.3\cdot10^{-5}$ oe^{-1}. Theoretical and experimental data are in good agreement. The data contained in Fig.2 were obtained for the same sample as shown in Fig. 1, but three months later. ...ing lowered n by 10% and shifted the oscillating curve of transverse reluctance to the left. The experimental data on the quantum oscillation maxima (but not on the minima) of transverse reluctance in InAs and InSb can be evaluated. There are 2 figures and 5 tables.

Card 2/4

SHALYT, S.S.

Charge and heat transfer phenomena in n-type indium arsenide at low temperatures. Fiz.tver.tela 4 no.7:1915-1927 Jl '62. (MIRA 16:6)

1. Institut poluprovodnikov AN SSSR, Leningrad.
(Indium arsenide) (Metals--Low temperatures)

The galvanomagnetic properties ...

was produced by slow cooling. The experimental results are compared with those obtained by other authors. The isoenergetic surface of the holes in tellurium closed to the extremum are ellipsoids of revolution whose axis is a symmetry axis of the third order. In the case of isotropic scattering, the ratio $m_{\perp}/m_{\parallel} = 1.25$ corresponds to a slightly flattened mass ellipsoid. This isotropic scattering is confirmed over a wide temperature interval by the constant ratios of the galvanomagnetic coefficients which characterize the galvanomagnetic properties of tellurium. Within this range of temperature the thermal scattering is replaced by scattering from the impurities. The ratio $m_1/m_3 = 1.2 \pm 0.2$ of the effective masses which determine the axes of the ellipsoid of revolution has a similar value. The experimentally and theoretically determined dependences of the ratio $\varrho_{3311}\,\varrho_{33}/R_1^2$ on the absolute temperature T agree fairly well up to $4^{\circ}K$, but deviate strongly at lower temperatures. It is found that $m_{\perp} = 0.43\ m_o$ and $m_{\parallel} = 0.35\ m_o$. The ratios $\varrho_{1111}/\varrho_{1133}$, $\varrho_{1122}\cdot\varrho_{33}/\varrho_{3311}\cdot\varrho_{11}$ and $\varrho_{1313}/\varrho_{3311}$ of the experimental coefficients of

Card 2/3

The galvanomagnetic properties ...

the galvanomagnetic tensor differ from the corresponding theoretical values, which is due to the nonuniform carrier distribution in the specimens investigated and to fluctuations of the relative values of the longitudinal resistance of various tellurium specimens under investigation. There are 15 figures and 2 tables.

ASSOCIATION: Institut poluprovodnikov AN SSSR, Leningrad (Institute of Semiconductors AS USSR, Leningrad)

SUBMITTED: July 13, 1962

Card 3/3

The thermoelectric properties ...

$$\alpha = \frac{k}{e}\left[r + 2 + \ln\frac{2(2\pi m^* kT)^{3/2}}{nh^3}\right], \qquad (1)$$

for nondegenerate semiconductors is due either to residual defects of structure or to the temperature dependence of the effective mass. The temperature dependence of the thermo-emf of degenerate specimens differs only slightly from the theoretical value $\alpha = (k/e)(\pi^2/3)(kT/\mu)$. In the simple case of an energy dependence of the free path $l \sim \varepsilon^r$, the effective mass can be determined at $T > 150^\circ K$ from the formula for α

$$\alpha = \frac{k}{e}\left[\frac{r+2}{r+1}\frac{F_{r+1}(\mu^*)}{F_r(\mu^*)} - \mu^*\right] \qquad (1a).$$

At lower temperatures and with concentrations exceeding 10^{16} cm^{-3} both the thermal and the impurity mechanism must be taken into account. α of nondegenerate semiconductors is likely to decrease with increasing carrier concentration. With concentrations between 10^{15} and 10^{19} cm^{-3}, and at temperatures from 100 to $200^\circ K$, the effective mass of the holes is likely

Card 2/3

On the question of the structure of the conduction zone of indium arsenide. L. L. Korenblit, D. V. Mashovets, S. S. Shalyt.

Report presented at the 3rd National Conference on Semiconductor Compounds, Kishinev, 16-21 Sept 1963

L 18173-63 EPR/EWT(d)/EPF(c)/EWT(l)/EPF(n)-2/EWP(q)/EWT(m)/BDS AFFTC ASD/SSD/IJP(C) Ps-4/Pr-4/Pu-4 JD/WW/JW/JG/DE

ACCESSION NR: AP3005216 S/0053/63/080/002/0331/0337

AUTHORS: Bresler, M. S.; Kogan, A. V.; Shalyt, S.S.; Elyashberg, G. M. 123

TITLE: All-union conference on low-temperature physics 89

SOURCE: Uspekhi fizicheskikh nauk, v. 80, no. 2, 1963, 331-337

TOPIC TAGS: Low temperature physics, conference

ABSTRACT: The 1962 annual Vsesoyuznoye soveshchaniye po fizike nizkikh temperatur (All-union conference on low-temperature physics) was held in Leningrad from 26 June through 1 July. The introductory address was made by N. Ye. Alekseyevskiy, chairman of Uchenv*y sovet problemy fiziki nizkikh temperatur (Sicence council for low-temperature problems). V. P. Peshkov discussed the basic trends of research and the various results obtained since the time of the preceding conference. B. N. Yesel'son and V. G. Ivanov extended the surface-tension measurements hitherto conducted for weak solutions of He^3 in He^3 to include large He^3 concentrations (10--50%). K. N. Zinov'yeva described investigations of the diagram of state of He^3-He^4 solutions at elevated pressures and at temperatures below 1.5°K. N. G. Bereznyak, I. V. Bogoyavlenskiy, and B. N. Yesel'son directed attention

Set 1/2, Card 1/3

primarily to solidification in mixtures containing up to 76% He^3. D. A. Tsakadze reported measurements of the coefficient of mutual friction along vortex lines. Yu. G. Mamaladze presented a theoretical treatment of critical velocities for vortex formation in He II. A. F. Andreev investigated the influence of conduction electrons on certain phenomena on the boundary between a metal and liquid helium. I. P. Ipatova and G. M. Eliashberg presented a theoretical study of the paramagnetic relaxation in liquid He^3. N. V. Zavaritskii described an investigation of the tunnel effect between a tin film and monocrystalline samples of varying crystallographic orientation. Various problems in the synthesis of superconducting alloys possessing extremely high critical magnetic fields (in the hundreds of thousands of Oersteds) and their use in solenoids for generation of strong magnetic fields formed the subjects of several papers (N. E. Alekseyevskiy, et al., B. G. Lazarev, et al., V. R. Karasik, S. Sh. Khmedov). A. M. Kolchin, N. I. Krivko, and N. M. Reynov measured the surface impedance of the alloy Nb - Zr. N. B. Brandt and N. I. Ginzburg have found a large difference in the properties of the two superconducting modifications of bismuth. B. G. Lazarev, L. S. Lazareva (Kan), and V. I. Makarov continued their previous studies of the pressure dependence of the critical temperature for tin and thallium. Measurements of the pressure dependence of the critical temperature for Nb_3Sn were reported by

L 18173-63
ACCESSION NR: AP3005216

B. G. Lazarev. L. S. Lazareva (Kan), O. N. Ovcharenko, and A. A. Matsakov. The quenching of superconductivity by current and the distribution of phases in the intermediate state have been investigated by N. E. Alekseyevskiy and E. A. Troynar by the ferromagnetic powder technique. A study has also been undertaken of the kinetics of the quenching of superconductivity by current (A. P. Smirnov, A. V. Rumyantseva, and V. N. Totubalin). A theoretical paper by I. A. Privorotskiy was devoted to the absence of an isotope effect for ruthenium. A paper by M. S. Khaykin and colleagues - R. T. Mina and V. S. Ekel'man - dealt with a cyclotron resonance of tin, lead and bismuth. V. F. Gantmakher found a new dimensional effect in thin specimens of tin while making measurements of the surface impedance of the samples at frequencies of 1 - 5 Mc.

[For Complete Set See: Bresler. M. S.
All-union conference on low-temperature physics]

Set 1/2, Card 3/3

L 18173-63 EPR/EWT(d)/EPF(c)/EWT(l)/EPF(n)-2/EWP(q)/EWT(m)/BDS AFFTC
ASD/SSD/IJP(C) Ps-4/Pr-4/Pu-4 JD/WW/JW/JG/DE
ACCESSION NR: AP3005216 S/0053/63/080/002/0331/0337 157

AUTHORS: Bresler, M. S.; Kogan, A. V.; Shalyt, S. S.; Elyashberg, G. M. 91

TITLE: All-union conference on low-temperature physics 21

SOURCE: Uspekhi fizicheskikh nauk, v. 80, no. 2, 1963, 331-337

TOPIC TAGS: Low temperature physics, conference

ABSTRACT: E. P Vol'skiy measured the quantum oscillations in the quasistatic conductivity of bismuth in a magnetic field at frequencies of 3 - 5 Mc. Papers by V. P. Naberezhnykh, A. A. Galkin and V. L. Mel'nik, and by P. A. Bezugly, A. A. Galkin and A. I. Pushkin dealt with investigations of cyclotron resonance and magnetoacoustic resonance in the same samples of aluminum, which made possible the direct comparison of results and simplified the reconstruction of the topology of the Fermi surface. N. E. Alekseyevskiy reported on galvanomagnetic investigations of the transition metals (N. E. Alekseyevskiv, V. Egorov, B. N. Kazak, and G. E. Karstens) in strong magnetic

Set 2/2, Card 1/5

fields (constant to 35 kOe and pulsed to 200 kOe). N. E. Alekseyevskiy also noted the applicability of galvanomagnetic measurements to the study of the Fermi surfaces of the transition metals, since the purity achieved in specimens of these metals is as yet far from that required by such methods as cyclotron resonance. N. E. Alekseyevskiy and Yu. P. Gaydukov have measured the anisotropy of the electrical resistance and of the Hall effect in cadmium, zinc and thallium; open Fermi surfaces were found for all of these metals. V. G. Volotskaya and N. Ya. Fogel' have investigated galvanomagnetic phenomena in very pure aluminum (resistivity ratio $300^{o}/4^{o}$ 2500-2000 as compared with previous values not exceeding 2000). B. N. Aleksandrov reported on a study of dimensional effects in a longitudinal magnetic field for high-purity tin, zinc, and aluminum. E. A. Kaner described a theory which he has developed for acoustic cyclotron resonance. N. B. Brandt, N. N. Stupochenko and T. F. Dolgolenko investigated the fine structure of the quantum oscillations in the magnetic susceptibility of bismuth in various crystalline directions at ultra-low temperatures. The amplifications of ultrasound in semi-metals was studied by R. F. Kazarinov and V. G. Skobov. L. A. Fal'kovskiy and A. A. Abrikosov have computed the energy spectrum the "bad" metals of the fifth group (bismuth, arsenic, antimony) by group theory methods, utilizing qualitative ideas concerning the

23

of cuprous oxide. Yu. N. Obraztsov developed a theory for thermomagnetic effects in semiconductors in quantized magnetic fields. A paper by I. I. Boyko, E. I. Rashba and V. I. Sheka analyzed the conditions leading to the possible observation of a new resonance effect in semiconductors, due to spin-orbit coupling. M. I. Kaganov and I. M. Lifshits computed the absorption of light in a metal whose Fermi surfaces contain degenerate points (evidently this is characteristic only of graphite). The Shubnikov-de Haas effect in $A^{III} B^{IV}$ compounds of electronic type was investigated in pulsed fields of up to 400 kOe by Kh. I. Amirkhanov, R. I. Bashirov, Yu. E. Zaklev, and A. Yu. Mollayev. O. V. Yemel'yanenko and D. N. Nasledov studied the electrical properties of gallium arsenide having a carrier concentration of $5 \times 10^{15} - 5 \times 10^{16}$ cm^{-3}, but with varying total impurity concentrations. N. E. Alekseyevskiy, Fam Zui Khien, V. G. Shapiro and V. S. Shpinel' have measured the resonance absorption probability for 28.3 keV gamma-quanta in slices of crystalline tin cut along various crystal planes. Resonance absorption of 35 keV gamma-quanta in Te^{125} formed the subject of a paper by V. V. Sklyarevskiy, B. N. Samoylov, E. P. Stepanov, I. I. Lukashevich, and R. A. Manakhov. Yu. M. Kagan delivered his paper "Toward a Theory for the Redward Thermal Displacement of the "Mossbauer Line". Papers "Assymetry of -radiation in Certain Nuclei, Polarized in an Alloy with Iron" and "Nuclear Specific Heats

structure of the bismuth type of lattice and the nature of the transition from "good" metals to dielectrics under deformation. R. G. Arkhipov derived a criterion for the occurrence of metals with small electron concentrations. M. I. Kaganov and V. G. Peschanskiy analyzed various mechanisms for the absorption of ultrasound in metals. V. P. Dobrego and S. M. Ryvkin studied conductivity in germanium alloyed with Group V or III impurities and having carrier concentrations of 10^{15} - 10^{16} cm^{-3}, in the presence of compensating impurities. S. M. Ryvkin, V. P. Dobrego, B. M. Konovalenko, and I. D. Yaroshetskiy have observed the appearance of the so-called induced impurity breakdown in germanium samples of the same degree of purity, but fully compensated. M. I. Kaganov proposed that attempts be made to observe additional exciton waves in a crystal due to the presence of space dispersion, using the deceleration of fast particles in a dielectric. L. S. Kukushkin spoke on his theory of non-radiative transition processes in molecular crystals. A paper by A. R. Kessel' and U. Kh. Kopvillem presented a calculation of the sensitivity of a quantum phonon counter which utilizes atoms in the ground state rather than in an excited state, so as to reduce the noise level. A paper was also presented by A. A. Kaplyanskiy on the influence of uniaxial deformations upon the optical spectra of crystals of the type of Ca F_2, Li F, etc., containing various impurities, as well as upon the exciton spectrum

L 18173-63

ACCESSION NR: AP3005216

of Certain Elements Alloyed with Iron" were delivered by A. V. Kogan, V. D. Kul'kov, L. P. Nikitin, N. M. Reynov, M. F. Stel-makh, and M. Shott. "Dynamic Polarization of Protons in Lanthanum-Magnesium Double Nitrate" was reported by V. I. Lushchikov, A. A. Manenkov, and Yu. V. Taran. A large number of papers concerned with the investigation of the properties of ferro- and antiferromagnetic substances were presented at the conference. A special session was devoted to techniques for the production of low temperatures and to methods for making various low temperature measurements. A number of papers dealt with problems concerning the mechanical properties and optics of crystals at low temperatures, and concerning techniques for producing high pressures and strong pulsed magnetic fields for low temperature research. On the last day of the conference, summaries of the papers presented at the various sectional sessions were presented by their respective chairmen. As the conference chairman, N. E. Alekseyevskiy, remarked in conclusion, only the practice of combining plenary sessions with concurrent sessions of individual sections can, in the opinion of the Scientific Council for the Problems, make it possible to "boil down" to reasonable dimensions the annually increasing flood of papers on low temperature physics.

ASSOCIATION: NONE

SUBMITTED: 00 DATE ACQ: 15 Aug 63 ENCL: 00

SUB CODE: PH NO REF SOV: 000 OTHER: 000

For Complete Set See: Bresler, M. S. - All-union conference on low-temperature physics

Set 2/2, Card 5/5

GUREVICH, V. L.; PARFENYEV, R. V.; FIRSOV, Yu. A.; SHALYT, S. S.

"The investigation of a new type oscillations in the magneto-resistance" [sic]

report submitted for Intl Conf on Physics of Semiconductors, Paris, 19-24 Jul 64.

KORENBLIT, L.L.; MASHOVETS, D.V.; SHALYT, S.S.

Structure of the conduction band and the electron scattering mechanism in indium arsenide. Fiz. tver. tela 6 no.2:559-575 F '64. (MIRA 17:2)

1. Institut poluprovodnikov AN SSSR, Leningrad.

ACCESSION NR: AP4013541 S/0181/64/006/002/0647/0649

AUTHORS: Shaly*t, S. S.; Parfen'yev, R. V.; Muzhdaba, V. M.

TITLE: Experimental confirmation of a new type of oscillation of transverse reluctance

SOURCE: Fizika tverdogo tela, v. 6, no. 2, 1964, 647-649

TOPIC TAGS: reluctance, current carrier, inelastic scattering, semiconductor, phonon, Larmor frequency, relaxation time

ABSTRACT: This type of oscillation, determined by inelastic scattering of current carriers in an undegenerate semiconductor, was proposed on theoretical grounds by V. A. Gurevich and Yu. A. Firsov (ZhETF, 40, 199, 1961). To observe this type of oscillation, it is necessary that the phonon spectrum of the crystal have an optical branch and that the experiment be carried out in a strong magnetic field. The authors define these conditions in terms of the Larmor frequency, relaxation time, and mobility. From a consideration of these and of the physical character of the oscillation, they arrive at a value for the period of the oscillation, depending on the effective mass and the energy of the optical phonons. The problem of distinguishing the proposed oscillation from others, especially the

Card 1/2

ACCESSION NR: AP4013541

Shubnikov-de Haas oscillation, is described. Since the latter appears most favorably at low temperature, a higher temperature must be considered, but this leads to a weakening of the effect through decrease in mobility and complications in the current-carrier spectrum. Some optimal temperature is sought. It was found that five maxima appear in undegenerate InSb at a temperature of 104K (H_m = 34.0, 17.0, 11.0, ~8.0, and ~6.5 oersteds·10^3) with a period of $\simeq 3 \cdot 10^{-5}$ oersteds^{-1}. The position of the maxima is independent of temperature, but the effect was found to weaken as the temperature declined from 104 to 63K and also as it increased to 200K. "We express our thanks to V. L. Gurevich for discussing our results and for his valuable suggestions." Orig. art. has: 1 figure and 1 formula.

ASSOCIATION: Institut poluprovodnikov AN SSSR, Leningrad (Institute of Semiconductors, AN SSSR)

SUBMITTED: 26Oct63 DATE ACQ: 03Mar64 ENCL: 00

SUB CODE: EC,SS NO REF SOV: 002 OTHER: 003

Card 2/2

L 19627-65 EWT(m)/EWP(t)/EWP(b) IJP(c)/SSD/ASD(a)-5/AS(mp)-2/AFWL/
ESD(gs)/ESD(t) RDW/JD
ACCESSION NR: AP4041696 S/0181/64/006/007/1979/1986

AUTHOR: Shaly*t, S. S.; Alivev, S. A.

TITLE: Structure of the conduction band and mechanism of electron scattering in mercury selenide

SOURCE: Fizika tverdogo tela, v. 6, no. 7, 1964, 1979-1986

TOPIC TAGS: mercury selenide, conduction band, electron scattering, electron gas, Hall effect, thermal emf, carrier density

ABSTRACT: A procedure previously employed for a case with intermediate degeneracy of the electron gas (A. A. Korenblit, D. Mashovets, S. S. Shaly*t, FTT v. 6, 555, 1964) is used to obtain experimental data on the Hall effect and thermal emf of a series of samples of n-type HgSe with different carrier densities in strong magnetic fields. These data are used to determine the concentration dependence of the effective mass and the dispersion law for the electrons in the

Card 1/3

L 19627-65
ACCESSION NR: AP4041696

conduction band, which agrees with the theory of E. O. Kane (Phys. Chem. Solids v. 1, 249, 1957) at concentrations up to 5×10^{19} cm^{-3}. In addition, the effective parameter of the scattering mechanism, which determines the dependence of the relaxation time τ on the position of the carriers in the band, in accordance with the formula

$$\tau = \tau_0 (k^2)^{r-1/2} \frac{d\varepsilon}{dk}$$

(k -- wave number, r -- scattering parameter, ε -- energy), is evaluated from data on the thermal emf in zero field and the magnetothermal emf. It is shown that this parameter remains constant ($r = +1/2$) in the entire investigated range of concentrations from 4×10^{17} to 5×10^{19} cm^{-3}. The method of preparing the samples is described. The reasons for the disparity between the present results and those of Rodot (Proc. conf. semicond. Prague, p. 1022, 1960) are briefly discussed. Orig. art. has: 8 figures, 12 formulas, and 1 table.

Card 2/3

L 19627-65
ACCESSION NR: AP4041696

2

ASSOCIATION: Institut poluprovodnikov AN SSSR, Leningrad (Institute of Semiconductors, AN SSSR); Institut fiziki AN Azerb. SSR, Baku (Institute of Physics AN Azerb. SSR)

SUBMITTED: 15Jan64 ENCL: 00

SUB CODE: EC, SS NR REF SOV: 001 OTHER: 009

Card 3/3

L 18850-65 EWT(1)/EWG(k)/EWT(m)/EPR/EWP(t)/EEC(b)-2/EWP(b) Pz-6/Ps-4 IJP(c)/
SSD/RAEM(a)/AFWL/ESD(gs)/ESD(t) JD/AT
ACCESSION NR: AP4043349 S/0181/64/006/008/2327/2332

AUTHORS: Shaly*t, S. S.; Tamarin, P. V.

TITLE: Concerning the thermal conductivity and thermoelectromotive force of InSb at low temperatures

SOURCE: Fizika tverdogo tela, v. 6, no. 8, 1964, 2327-2332

TOPIC TAGS: indium antimonide, thermal conductivity, thermal emf, low temperature phenomenon, single crystal, impurity content

ABSTRACT: The aim was to obtain accurate data on the thermal conductivity and thermoelectromotive force of InSb at low temperatures in order to compare such data with published experimental and theoretical work. A very pure n-type ($n = 7 \times 10^{13}$ cm^{-3}, $u_{max} = 9.5 \times 10^5$ cm^2.V^{-1}sec^{-1} at 50K) single crystal was used. The thermal conductivity (investigated from 2 to 140K) was found to be insensi-

Card 1/3

tive to the concentration of electrically detectable impurities, at least up to concentrations of 10^{17} cm^{-3}, contradicting E. V. Mielczarek and H. P. Frederikse's conclusion that the thermal resistance of single-crystal InSb between 10 and 50K was principally due to impurities (Phys. Rev., v. 115, 888, 1959). The thermoelectromotive force (2--300K) had a phonon-drag component with a maximum of 160 μV/deg at 16K, compared with a theoretical value of 200 μV/deg. This contrasts with the results of Frederikse and Mielczarek (Phys. Rev., v. 99, 1889, 1955) who found the phonon-drag effect in p-type but not in n-type InSb ($n = 7 \times 10^{15}$ cm^{-3}, $u = 10^5$ $cm^2 . V^{-1} . sec^{-1}$ at 80K). The thermal conductivity and thermoelectromotive force maxima (at 8 and 16K, respectively) did not coincide, in agreement with C. Herring's theory (Halbleiter and Phosfore, v. 5, 184, 1958). Orig. art. has: 4 figures and 4 formulas.

APPROVED FOR RELEASE: 08/23/2000 CIA-RDP86-00513R001548420011-5"

L 18850-65

ACCESSION NR: AP4043349

ASSOCIATION: Institut poluprovodnikov AN SSSR, Leningrad (Institute for Semiconductors, AN SSSR)

SUBMITTED: 13Feb64 ENCL: 00

SUB CODE: EC, SS NR REF SOV: 004 OTHER: 006

Card 3/3

L 11078-65 EWT(m)/EWP(t)/EWP(b) IJP(c) JD

ACCESSION NR: AP4046656 S/0181/64/006/010/3194/3196

AUTHORS: Muzhdaba, V. M.; Parfen'yev, R. V.; Shaly*t, S. S. (4)

TITLE: Magnetophonon oscillation of the thermal emf of n-InSb in a longitudinal magnetic field 21

SOURCE: Fizika tverdogo tela, v. 6, no. 10, 1964, 3194-3196

TOPIC TAGS: magnetophonon resonance, thermal emf, indium a-timonide magnetoresistance, magnetothermal emf

ABSTRACT: The authors have shown experimentally that the magnetophonon resistance, first treated theoretically by Gurevich and Firsov (ZhETF v. 40, 199, 1961 and v. 41, 512, 1961) is manifest in another kinetic effect, namely the dependence of the thermal emf of InSb on the intensity of the longitudinal magnetic field. This experimental effect was already mentioned briefly by S. M. Puri and T. H. Geballe (Bull. Am. Phys. Soc. v. 8, 309, 1963). A plot of

Card 1/4

the relative value of the longitudinal magnetothermal emf against the magnetic field intensity, taken at different temperatures (Fig. 1 of the enclosure), discloses an oscillation similar to that disclosed by the magnetoresistance. The difference in the new effect, however, is that the magnetothermal emf, unlike the magnetoresistance, exhibits neither minima nor maxima near the resonant values of the magnetic field, but some intermediate values. As in the case of the longitudinal magneto-resistance, the maxima and minima shift towards weaker fields, although to a lesser degree. The sample of n-type indium antimonide used in the investigation had a concentration $n = 3.5 \times 10^{13}$ cm^{-3} and a mobility $u = 5.6 \times 10^{5}$ cm^2/V-sec at T = 77K; its thermal emf in the absence of a field increased from 585 μV/deg at 83.4K to 645 μV/deg at 150K. The absolute value of the thermal emf increased in the magnetic field. Similar tests made in a transverse magnetic field showed no noticeable oscillation. This agrees with the theoretical conclusion that the thermal emf in an extremely strong transverse field does not depend on the

L 11078-65
ACCESSION NR: AP4046656

4

mechanism whereby the carriers are scattered. "We are grateful to Yu. A. Firsov and S. T. Pavlov for a discussion of the theoretical problems and to student G. A. Kurbatov for help with the measurements." Orig. art. has: 1 figure and 1 formula.

ASSOCIATION: Institut poluprovodnikov AN SSSR, Leningrad (Institute of Semiconductors AN SSSR)

SUBMITTED: 13Jun64 ENCL: 01

SUB CODE: SS, EM NR REF SOV: 002 OTHER: 001

Card 3/4

ACCESSION NR: AP4043614 S/0056/64/047/002/0444/0451

AUTHORS: Parfen'yev, R. V.; Shaly*t, S. S.; Muzhdaba, V. M.

TITLE: Experimental confirmation of the magnetophonon resonance in n-type InSb

SOURCE: Zh. eksper. i teor. fiz., v. 47, no. 2, 1964, 444-451

TOPIC TAGS: semiconductor resistance, quantum statistics, galvanomagnetic effect, indium antimonide, carrier density, low temperature phenomenon, phonon

ABSTRACT: This is a continuation of an earlier report (FTT v. 6, 647, 1964) of a new effect, first observed by S. M. Puri and T. H. Geballe, consisting of a new type of oscillation of magnetoresistance of a semiconductor, and resulting from inelastic scattering of the carriers by optical phonons. The present article describes the results of a detailed experimental investigation of the trans-

Card 1/4

ACCESSION NR: AP4043614

verse and longitudinal magnetoresistance of various samples of n-InSb. The results of the tests, which were made in a strong magnetic field, confirm the theoretical analysis of this effect, made by V. L. Gurevich and Yu. A. Firsov and published in the same issue of the journal (ZhETF, v. 47, 734, 1964). The tests were made at T = 90K in fields up to ~38 kOe. The results show that the new type of oscillation differs from the Shubnikov-deHaas oscillation in that the former does not depend on the carrier density and its amplitude decreases with decreasing temperature and practically disappears at nitrogen temperatures, whereas the latter is observed only at very low temperatures and is determined only by the carrier density. Furthermore, the former can occur for any statistics of the electron gas, whereas the latter can occur only in a degenerate gas. Weak but noticeable oscillations of this type were observed on the longitudinal magnetoresistance curve of InAs, too, showing that this effect can be observed in other semiconductors. "In conclusion, the authors thank V. L. Gurevich and Yu. A. Firsov for suggesting the

Card 2/4

ACCESSION NR: AP4043614

research topic and for a discussion of the theoretical problems, and M. V. Aleksandrova for great help with the measurements." Orig. art. has: 5 figures, 1 formula, and 1 table.

ASSOCIATION: Institut poluprovodnikov Akademii nauk SSSR (Institute of Semiconductors, Academy of Sciences, SSSR)

SUBMITTED: 06Mar64 ENCL: 01

SUB CODE: SS NR REF SOV: 003 OTHER: 004

Card 3/4

L 34709-65 EWT(l)/EWT(m)/EEC(t)/EWP(b)/EWP(t) Peb IJP(c) JD

ACCESSION NR: AP5000314 S/0056/64/047/005/1683/1686

AUTHORS: Shaly*t, S. S.; Parfen'yev, R. V.; Aleksandrova, M. V.

TITLE: Concerning a new type of oscillation of longitudinal magnetoresistance of n-InSb

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 47, no. 5, 1964, 1683-1686

TOPIC TAGS: magnetoresistance, galvanomagnetic effect, indium antimonide, electron scattering, inelastic scattering, phonon

ABSTRACT: This is a continuation of earlier research by some of the authors (Parfen'yev, Shaly*t, and V. M. Muzhdaba, ZhETF v. 47, 444, 1964) and is devoted to the temperature dependence of the oscillations of longitudinal magnetoresistance of n-InSb in a strong magnetic field. These oscillations were first predicted theoretically by V. L. Gurevich and Yu. A. Firsov (ZhETF v. 40, 199, 1961) and

Card 1/3

are due to inelastic scattering of electrons by optical lattice vibrations. The tests were made on single crystal n-InSb ($n = 4 \times 10^{13}$ cm^{-3}, $u = 4.9 \times 10^5$ $cm^2/V\text{-sec}$ at T = 90K) in the temperature range from 90 to 200K. The results show that with increasing temperature the minima of the oscillating part of the magnetoresistance move away from the resonant values of the magnetic field, and are replaced by maxima. The reason for this shift is attributed to the role played by optical phonons in the scattering of electrons in pure n-InSb, which increases with increasing temperature. A noticeable change in the electron concentration (by a factor of 30) does not result in a noticeable phase shift of the oscillation curves. Orig. art. has: 2 figures and 1 formula.

ASSOCIATION: Institut poluprovodnikov Akademii nauk SSSR (Institute of Semiconductors, Academy of Sciences SSSR); Institut fiziki poluprovodnikov Akademii nauk SSSR (Institute of Semiconductor Physics, Academy of Sciences SSSR)

L 14518-65 EWT(l)/EWG(k)/EWT(m)/T/EWP(t)/EWP(b)/EWA(h) Pz-6/Peb IJP(c)/AFWL/
SSD/RAEM(a)/ESD(gs)/ESD(t) JD/AT
ACCESSION NR: AP5000366 S/0056/64/047/005/2007/2009

AUTHORS: Mashovets, D. V.; Parfen'yev, R. V.; Shaly*t, S. S.

TITLE: New data on magnetophonon oscillations of the longitudinal magnetoresistance of n-InSb

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 47, no. 5, 1964, 2007-2009

TOPIC TAGS: galvanomagnetic effect, magnetoresistance, magnetophonon oscillation, indium antimonide

ABSTRACT: In this continuation of earlier work (ZhETF v. 47, 444, 1964), the measurements were made in pulsed magnetic fields and have shown that the magnetoresistance of n-InSb continues to oscillate also at fields stronger than in the earlier study (stronger than 38 kOe). The results are shown in Fig. 1 of the enclosure. The oscillation at stronger fields (H > 40 kOe) is attributed, in

Card 1/3

L 14518-65
ACCESSION NR: AP5000366

3

analogy with the earlier studies in weaker fields, to spin splitting of the Landau levels, although it is pointed out that there are no experimental data on the transverse effect at strong fields. The value obtained for the g factor on the basis of this assumption (g = 56) is in good agreement with other data. A more accurate analysis calls for further theoretical development. "We thank V. L. Gurevich and S. T. Pavlov for a discussion of the results." Orig. art. has: 1 figure.

ASSOCIATION: Institut poluprovodnikov Akademii nauk SSSR (Institute of Semiconductors, AN SSSR)

SUBMITTED: 11Sep64 ENCL: 01

SUB CODE: SS NR REF SOV: 004 OTHER: 003

Card 2/3

L 14518-65
ACCESSION NR: AP5000366

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ENCLOSURE: 01

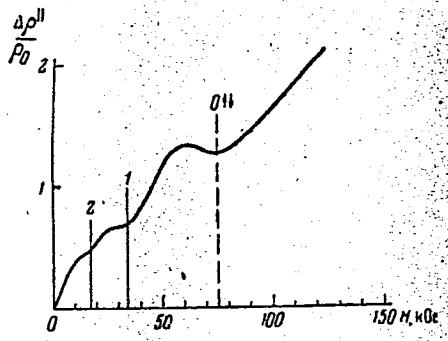

Fig. 1. Dependence of the longitudinal magnetoresistance of n-InSb on the magnetic field intensity at T = 90K. Electron density $n = 6 \times 10^{13} cm^{-3}$, mobility $u = 6 \times 10^5 cm^2/V.sec$

Vertical lines - resonant values of field

Card 3/3

L 51549-65 EWT(1)/EWT(m)/EPA(w)-2/EEC(t)/EWP(t)/EWP(b)/EWA(m)-2 Pi-4/Pz-6
ACCESSION NR: AP5010758 IJP(c) JD/AT UR/0181/65/007/004/1266/1268

42
37
B

AUTHOR: Bresler, M. S.; Parfen'yev, R. V.; Shalyt, S. S.

TITLE: Concerning the effect of the electron spin on the Shubnikov--deHaas oscillations in n-InSb

SOURCE: Fizika tverdogo tela, v. 7, no. 4, 1965, 1266-1268

TOPIC TAGS: Shubnikov deHaas effect, magnetoresistance, electron spin, indium antimonide, single crystal

ABSTRACT: The authors investigated experimentally the transverse and longitudinal magnetoresistance of single-crystal InSb (1.5 x 2 x 17 mm) with concentration n = $= 1.5 \times 10^{16}$ cm^{-3} at T = 1.4K, in order to check against the theory of L. E. Gurevich and A. L. Efros (ZhETF v. 43, 561, 1962) dealing with the Shubnikov--deHaas effect. The results have shown that the spin splitting of the first maximum of the magnetoresistance, which is expected from the theory, can be clearly seen in the transverse magnetoresistance and is less pronounced although visible on the longitudinal magnetoresistance curve. The numerical values obtained for the corresponding magnetic field differ from the theoretical predictions but it is shown that in

Card 1/2

L 51549-65

ACCESSION NR: AP5010758

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view of the uncertainty relation better accuracy cannot be expected under the experimental conditions. "We thank S. T. Pavlov, Yu. A. Firsov, and A. L. Efros for a discussion of the theoretical questions connected with the investigated phenomenon, and D. V. Mashovets for help with the measurements." Orig. art. has: 1 figure and 2 formulas.

ASSOCIATION: Institut poluprovodnikov AN SSSR, Leningrad (Institute of Semiconductors AN SSSR)

SUBMITTED: 27Nov64 ENCL: 00 SUB CODE: SS, NP

NR REF SOV: 004 OTHER: 001

Card 2/2

L 65238-65 EWT(1)/EWP(n)-2/EWA(1) WW

ACCESSION NR: AP5012594 UR/0181/65/007/005/1590/1592

AUTHOR: Aliyev, S. A.; Nashel'skiy, A. Ya.; Shalyt, S. S.

TITLE: Thermal conductivity and thermal emf of n-type indium phosphide at low temperatures

SOURCE: Fizika tverdogo tela, v. 7, no. 5, 1965, 1590-1592

TOPIC TAGS: thermal conductivity, thermal emf, indium compound, semiconducting material, phonon interaction, phonon scattering, electron scattering

ABSTRACT: The purpose of investigating simultaneously the thermal conductivity and thermal emf at low temperatures in the same sample was to disclose certain interesting features of electron-phonon interaction, which manifest themselves in experiment in an electron dragging effect. The authors investigated a coarse-grain polycrystal of InP (1.3 x 2.5 x 40 mm), in which the electron density and mobility at 77K were 2×10^{16} cm^{-3} and 8000 $cm^2/V\text{-sec}$. The thermal conductivity was investigated in a vacuum chamber at a pressure less than 10^{-5} mm Hg. The temperature difference was measured in the 2--300K range. The results are shown in Fig. 1 of the Enclosure. On the descending branch of the curve, the temperature dependence of the thermal conductivity agrees with the theory of J. Callaway (Phys. Rev. v. 113, 1046, 1959), and the temperature dependence of the thermal emf reflects the

Card 1/3

L 65238-65

ACCESSION NR: AP5012594 6

dragging of the electrons by the phonons. From the fact that the maxima of both curves coincide it is deduced that the major role in the investigated InP sample was played by pointlike defects, which scatter the short-wave phonons more strongly. It is also concluded that in the region of the maximum of the thermal emf (16K) the electrons are scattered by ionized impurities. The fraction of the phonon component of the thermal emf at this temperature is found to be 300 μV/deg. Orig. art. has: 2 figures.

ASSOCIATION: Institut poluprovodnikov AN SSSR, Leningrad (Institute of Semiconductors, AN SSSR); Institut fiziki AN AzSSR, Baku (Institute of Physics, AN AzSSR)

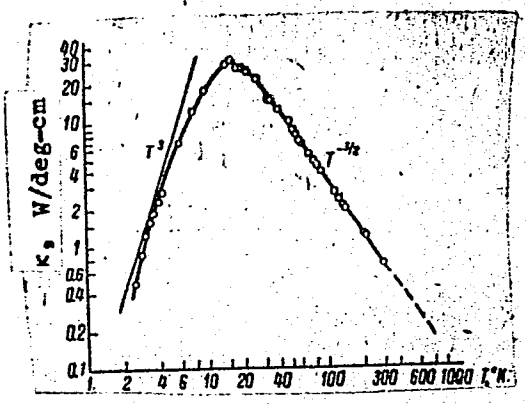
SUBMITTED: 31Dec64 ENCL: 01 SUB CODE: SS, TD

NR REF SOV: 002 OTHER: 005

Card 2/3

L 65238-65

ACCESSION NR: AP5012594 ENCLOSURE: 01



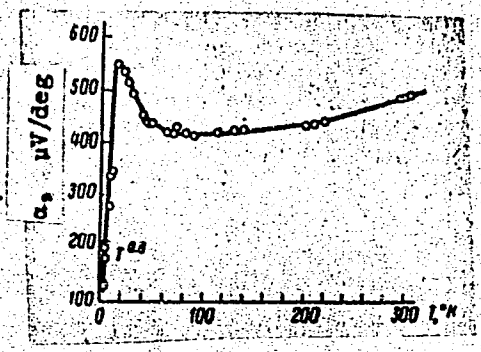


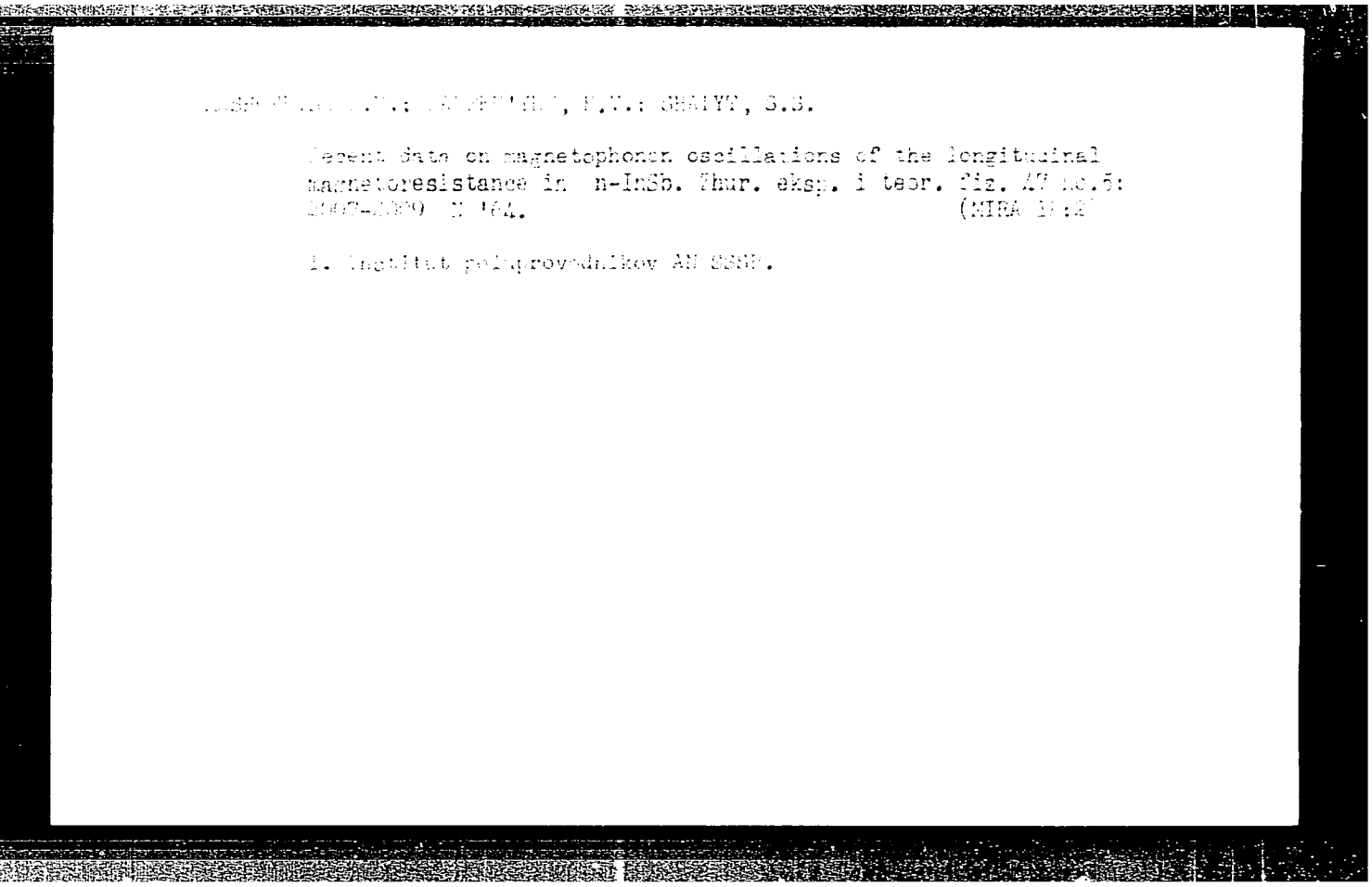
Fig. 1. Experimental results. Left - temperature dependence of the thermal conductivity of indium phosphide. Right- temperature dependence of the thermal emf of indium phosphide.

Card 3/3

ALIYEV, [illegible], KO[illegible], [illegible], [illegible], [illegible]

Temperature dependence of the effective electron mass and some data on their scattering in mercury selenide. Fiz. tver. tela 7 no.6:1673-1679 Je '65. (MIRA 18:6)

1. Institut poluprovodnikov AN SSSR, Leningrad i Institut fiziki AN AzerbSSR, Baku.



[illegible], P.V.; SHALYT, S.S.

Recent data on magnetophonon oscillations of the longitudinal magnetoresistance in n-InSb. Zhur. eksp. i teor. fiz. 47 no.5: [illegible] '64. (MIRA 17:8)

1. Institut poluprovodnikov AN SSSR.

L 52971-65 EWT(l)/EWT(m)/EWG(m)/EPR/T/EWP(t)/EWG(c)/EWP(b) Pz-6/Ps-4 IJP(c)
JD/AT

ACCESSION NR: AP5010526 UR/0056/65/048/004/1212/1214

34
31
B

AUTHOR: Shalyt, S. S.; Parfen'yev, R. V.; Bresler, M. S.

TITLE: Quantum oscillations of the thermoelectric power in n-type InSb

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 48, no. 4, 1965, 1212-1214

TOPIC TAGS: quantum oscillation, thermoelectric power, magnetoresistance, galvanomagnetic effect, spin splitting

ABSTRACT: The authors found that at helium temperatures the thermoelectric power of InSb in a transverse magnetic field exhibits the same oscillatory dependence as the transverse magnetoresistance. The study was made on a single-crystal sample of InSb (2.7 x 3 x 40 mm) with carrier density $n(H \to 0) = 1.32 \times 10^{15}$ cm^{-3} and mobility $u = 9 \times 10^{4}$ cm^2/V-sec (at T = 4.2K). It is deduced that the quality of the phases of the maxima of the oscillations of both quantities is not a trivial result, since the magnetoresistance oscillations are determined to a considerable degree by the periodic variations of the scattering probability, while the thermoelectric power oscillations appear in the theory even without scattering, and are

Card 1/2

L 52971-65

ACCESSION NR: AP5010526

3

due only to oscillations of the entropy. As in an earlier study by the authors (FTT v. 7, 1276, 1965), there is appreciable broadening of the Landau levels and it is still impossible to estimate the g-factor with acceptable accuracy, in spite of the use of stronger fields (22--30 kOe) in which the spin splitting appears more clearly. "We are grateful to A. L. Efros and Yu. N. Obraztsov for discussing the theoretical problems." Orig. art. has: 2 figures and 1 formula.

ASSOCIATION: Institut poluprovodnikov Akademii nauk SSSR (Institute of Semiconductors, Academy of Sciences SSSR)

SUBMITTED: 28Jan65 ENCL: 00 SUB CODE: SS

NR REF SOV: 006 OTHER: 001

Card 2/2

L 36257-66 EWP(t)/ETI IJP(c) JD

ACC NR: AP6019276 SOURCE CODE: GE/0030/66/015/002/0745/0749

AUTHOR: Bresler, M. S.; Redko, N. A.; Shalyt, S. S.

ORG: Institute of Semiconductors, Academy of Sciences of the USSR, Leningrad

TITLE: Quantum oscillation of transport coefficients in n-type indium arsenide

SOURCE: Physica status solidi, v. 15, no. 2, 1966, 745-749

TOPIC TAGS: quantum oscillation, transport ~~coefficient~~ theory, indium arsenide, magnetoresistance, Hall coefficient

ABSTRACT: Oscillations in the magnetoresistance, Hall coefficient, and thermoelectric power in transverse and longitudinal strong magnetic fields are studied for different polycrystalline samples of n-InAs at liquid helium temperatures. Some percularities, which have also been observed in n-InSb, cannot be explained by the existing theory and need special theoretical study. The authors wish to thank R. V. Parfeniev and Yu. N. Obraztsov for stimulating discussions. Orig. art. has: 4 figures and 2 formulas. [Authors' abstract.] [KS]

SUB CODE: 20/ SUBM DATE: 18Mar66/ ORIG REF: 007/

Card 1/1

L 22542-66 EWT(l)/EWT(m)/ETC(f)/EWG(m)/EWP(t) IJP(c) RDW/JD/JG/AT

ACC NR: AP6009646 SOURCE CODE: UR/0181/66/008/003/0705/0711

AUTHOR: Aliyev, S. A.; Korenblit, L. L.; Shalyt, S. S.

ORG: Institute of Semiconductors, AN SSSR, Leningrad (Institut poluprovodnikov AN SSSR); Institute of Physics, AN AzSSR, Baku (Institut fiziki AN AzSSR)

TITLE: Electron and lattice thermal conductivity of mercury selenide

SOURCE: Fizika tverdogo tela, v. 8, no. 3, 1966, 705-711

TOPIC TAGS: thermal conduction, mercury compound, selenide, electron scattering, elastic scattering, electron mobility, crystal lattice

ABSTRACT: This is a continuation of earlier research by the authors on mercury selenide (FTT v. 7, 1671, 1965 and v. 6, 1979, 1964) and its properties. In the present article the authors determine separately the lattice and the electronic components of the thermal conductivity for different single and polycrystalline samples of HgSe with electron densities from 3.7×10^{17} to 6×10^{18} cm^{-3}, by suppressing the electronic part of the thermal conductivity with the aid of a strong magnetic field. The thermal conductivity was measured by determining the stationary heat flow through the investigated sample when the latter was placed in a vacuum chamber. The method is based on determining the energy balance during scat-

Card 1/2

tering of electrons in the crystal (degree of elasticity of the collisions between the carriers and the scatterers) by investigating the behavior of the Lorentz number in degenerate semiconductors. It is pointed out that the method employed of separating the lattice and electronic specific thermal conductivity components can be used only for a limited number of n-type semiconductors, in which the carrier mobility is sufficiently high to be able to suppress the electronic component in a realizable stationary magnetic field, and in which the electronic component is not less than 4--5% of the total thermal conductivity of the crystal. The results show that the Lorentz number in the Wiedemann-Franz relation amounts to not more than 60% of its Sommerfeld value at T > 100K, when the scattering becomes of the impurity type and acquires an elastic character with decreasing temperature. The authors thank A. M. Zaslavskiy for determining the crystal structure of the investigated HgSe samples. Orig. art. has: 7 figures, 8 formulas, and 1 table.

SUB CODE: 20/ SUBM DATE: 15Jul65/ ORIG REF: 002/ OTH REF: 003

L 11360-67 EWT(l)/EWT(m)/EWP(t)/ETI IJP(c) JD

ACC NR: AP7000398 SOURCE CODE: UR/0386/66/004/009/0362/0364

AUTHOR: Kashovets, D. V.; Shalyt, S. S. 24

ORG: Institute of Semiconductors, Academy of Sciences SSSR (Institut poluprovodnikov Akademii nauk SSSR)

TITLE: Oscillations of the Magnetoresistance of tellurium

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 4, no. 9, 1966, 362-364

TOPIC TAGS: tellurium, magnetoresistance, galvanomagnetic effect, semiconductor carrier, carrier density, quantum resonance phenomenon

ABSTRACT: The purpose of the article is to explain why the magnetoresistance of tellurium exhibits in a strong magnetic field periodicity in the reciprocal field 1/H. Arguments favoring magnetophonon resonance as the cause of the observed oscillations in tellurium are presented on the basis of various experimental data and on the basis of an earlier analysis by one of the authors (Shalyt et al., ZhETF v. 47, 444, 1964). Although a quantitative analysis of the experimental curves can hardly lead at present to unambiguous results, since there are not enough available data on the physical properties of tellurium, it is possible to correlate the results of optical and thermoelectric investigations with the optical frequencies causing magnetophonon resonance in Te. The authors thank R. V. Parfen'yev and I. I. Farbshteyn for a useful discussion of the experimental results, and V. L. Gurevich and Yu. A. Firsonv for an in-

Card 1/2

L 11392-67 EWT(l)/EWT(m)/EWP(t)/ETI IJP(c) AT
ACC NR: AP7000394 SOURCE CODE: UR/0386/66/004/009/0348/0352

AUTHOR: Bresler, M. S.; Parfen'yev, R. V.; Red'ko, N. A.; Shalyt, S. S. 27

ORG: Institute of Semiconductors, Academy of Sciences SSSR, Leningrad (Institut poluprovodnikov Akademii nauk SSSR)

TITLE: Nernst effect in n-InSb in a quantizing magnetic field

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 4, no. 9, 1966, 348-352

TOPIC TAGS: Nernst effect, indium compound, antimonide, magnetoresistance, galvanomagnetic effect, low temperature research

ABSTRACT: This is a continuation of earlier experiments (FTT v. 8, 1776, 1966) where it was shown that quantization of the energy spectrum of the electrons of indium antimonide placed in a strong magnetic field becomes manifest at low temperatures in an oscillating field dependence of a number of kinetic coefficients. Since some of these results cannot be explained by the existing theory and call for further study, the authors have investigated the thermomagnetic Nernst effect in n-InSb. The experimental conditions (temperature, carrier density, range of magnetic fields) were such that they observed for the first time oscillations of the Nernst effect in a semiconductor, and were also able to follow continuously the sharp decrease of the Nernst coefficient in the classical region of strong fields ($uH/c \gg 1$), its transition in the region of quantum oscillations ($\zeta \gtrsim \hbar \gg kT$), and the subsequent transition to the

Card 1/2

L 11392-67

ACC NR: AP7000591

region of the quantum limit ($\hbar\Omega \ll \xi$) (u = mobility, ξ = chemical potential, Ω = cyclotron frequency). To determine the phase relations, the Nernst-coefficient curve was compared with the plots of the magnetoresistance and the magnetothermal emf in a transverse field and with the plot of the Hall coefficient, obtained simultaneously in the investigation of single-crystal n-InSb. The system of maxima on the plot of the Nernst coefficient A forms a periodic sequence in the reciprocal field which coincides with the periodicity of the magnetoresistance and magnetothermal-emf curves, but the oscillating Nernst-effect curve is shifted relative to the in-phase magnetoresistance and magnetothermal-emf curves in a transverse field by four periods, similar to the shift observed earlier for the magnetothermal emf in a longitudinal field. It is concluded that the results cannot be adequately interpreted theoretically until more data become available. Orig. art. has: 1 figure and 1 formula.

SUB CODE: 20/ SUBM DATE: 20Jul66/ ORIG REF: 001/ OTH REF: 001

Card 2/2 egk

SHALYT, S. Ya.

The elasto-viscous properties of printing inks. L. A. Kozarovitskii and S. Ya. Shalyt. *Kolloid. Zhur.* 15, 437–41(1953).—The yield point P for shear of 9 com. printing inks increased in time after destruction of the ink structure by stirring; 1 min. after discontinuation of the stirring, P ranged from 360 to 8700 dynes/sq. cm. and gradually increased, e.g., twofold. This thixotropic setting was practically accomplished in 2 hrs. The final P was about 1, 12, and 22 $\times$ 10^3 for inks contg. 8, 20, and 25% gas carbon in polymerized linseed oil. The 20% ink had, e.g., modulus of true elasticity 17 $\times$ 10^4 dynes/sq. cm., true viscosity 13 $\times$ 10^6 poises, viscosity of elastic after-effect 5 $\times$ 10^6 poises, period of relaxation 280 sec., and period of elastic after-effect 80 sec. J. J. Bikerman

[redacted], L. A.

"Study of the Structural Mechanical Properties of Printing Inks and the Behavior of the Latter in Printing Processes" (Issledovaniye struktur-no-mekhanicheskikh svoystv pechatnykh krasok i povedeniye poslednikh v pechatnykh protsessakh) from the book Trudy of the Third All-Union Conference on Colloid Chemistry, pp. 197-204, Izd. AN SSSR, Moscow, 1956

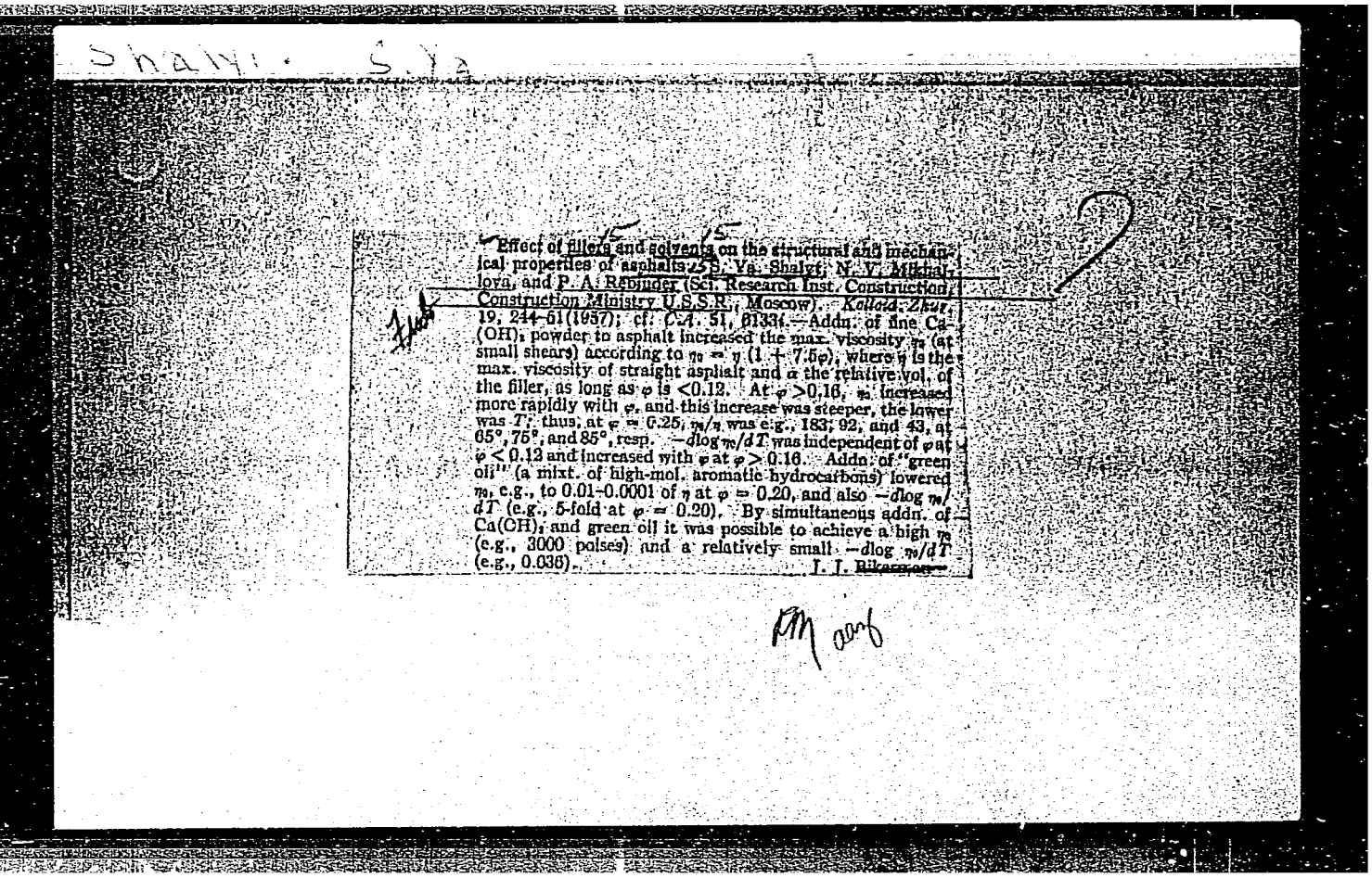
(Report given at above conference, Minsk, 21-4 Dec 53)

Authors: All-Union Scientific Research Insitute of the Polygrophic Industry and Engineering

SHALYI, S. Ya.

The effect of temperature on the flow and viscosity of bitumen. S. Ya. Shalyt and N. V. Mikhailov (Sci. Research Construction Inst., Moscow). *Kolloid. Zhur.* 18, 609–14(1956).—An oxidized petroleum bitumen was a "solid" with a yield stress at 20°; between 40° and 140° its viscosity, η, was independent of shear stress, P, at small P and at large P, and decreased on increasing P at medium P values. η, at small P, was 4000, 1250, and 470 poises at 65, 75, and 85°; the low η found was about $^1/_8$ of the highest value for η. Above 140° the bitumen behaved as a Newtonian liquid. Analogous results were obtained on other bitumens.

J. J. Bikerman



Shaiyt. S. Ya

Effect of fillers and solvents on the structural and mechanical properties of asphalts. S. Ya. Shaiyt, N. V. Mikhailova, and P. A. Rebinder (Sci. Research Inst. Construction, Construction Ministry U.S.S.R., Moscow). *Kolloid. Zhur.* 19, 244-61 (1957); cf. *C.A.* 51, 6133i.—Addn. of fine $Ca(OH)_2$ powder to asphalt increased the max. viscosity η_0 (at small shears) according to $\eta_0 = \eta(1 + 7.5\varphi)$, where η is the max. viscosity of straight asphalt and α the relative vol. of the filler, as long as φ is <0.12. At $\varphi > 0.16$, η_0 increased more rapidly with φ, and this increase was steeper, the lower was T; thus, at $\varphi = 0.25$, η_0/η was e.g., 183, 92, and 43, at 65°, 75°, and 85°, resp. $-d\log\eta_0/dT$ was independent of φ at $\varphi < 0.12$ and increased with φ at $\varphi > 0.16$. Addn. of "green oil" (a mixt. of high-mol. aromatic hydrocarbons) lowered η_0, e.g., to 0.01–0.0001 of η at $\varphi = 0.20$, and also $-d\log\eta_0/dT$ (e.g., 5-fold at $\varphi = 0.20$). By simultaneous addn. of $Ca(OH)_2$ and green oil it was possible to achieve a high η_0 (e.g., 3000 poises) and a relatively small $-d\log\eta_0/dT$ (e.g., 0.036). I. J. Bikerman